40 CFR Part 61
National Emission Standards
for Hazardous Air Pollutants

CLEAN AIR ACT COMPLIANCE REPORT
(Version 3.0 November 1989)

Facility: West Valley Demonstration Project (DOE)

Address: Rock Springs Road
West Valley , NY. 14171
Annual Assessment for Year: 1989
Date Submitted: 7/30/90

Comments: Dose Assessment for PVUs (no emissions control equipment)

Prepared By:

Name: Ernesto R. Faillace, D.Eng.
Title: Staff Nuclear Engineer
Phone #: (716) 942-4471

Prepared for:
U.S. Environmental Protection Agency
Office of Radiation Programs
Washington, D.C. 20460

CLEAN AIR ACT COMPLIANCE REPORT 7/30/90 2:52 PM

cility: West Valley Demonstration Project (DOE)
Address: Rock Springs Road City: West Valley State: NY

Comments: Dose Assessment for PVUs (no emissions control equipment)
Year: 1989

	Dose Equivalent Rates to Nearby Individuals (mrem/year)
Effective Dose Equivalent	0.0001*
Highest Organ Dose is to ENDOSTEUM	0.0021

----------EMISSION INFORMATION----------

Radio-nuclide	Class	Amad	Stack PVU (Ci/y)
SR-90	D	1.0	1.0E-05
AM-241	W	1.0	1.0E-07
Stack Height (m)			1.00
tack Diameter (m)			0.00
Momentum (m/s)			0.0

* DOSE RATE AT ACTUAL LOCATION OF RESIDENCE (1900 m NNW) IS 1.0 E-4 mrem/yr

----------SITE INFORMATION----------

Wind Data	89WVDP10.WND	Temperature (C)	20
Food Source	LOCAL	Rainfall (cm/y)	94
Distance to Individuals (m)	1900	Lid Height (m)	1000

*NOTE: The results of this computer model are dose estimates. They are only to be used for the purpose of determining compliance and reporting per 40 CFR 61.93 and 40 CFR 61.94.

ORGAN DOSE TO THE MAXIMALLY EXPOSED INDIVIDUAL

ORGAN	DOSE EQUIVALENT RATE TO THE ORGAN (mrem/y)
GONADS	2.0E-05
BREAST	4.4E-06
RED MARROW	4.2E-04
LUNGS	1.4E-05
THYROID	4.3E-06
ENDOSTEUM	2.1E-03
REMAINDER	7.1E-05
EFFECTIVE	1.4E-04

DOSE TO THE MAXIMALLY EXPOSED INDIVIDUAL
BY PATHWAY FOR ALL RADIONUCLIDES

	EFFECTIVE DOSE EQUIVALENT (mrem/y)	DOSE EQUIVALENT TO THE ORGAN WITH THE HIGHEST DOSE ENDOSTEUM (mrem/y)
INGESTION	6.4E-05	7.4E-04
INHALATION	7.7E-05	1.3E-03
AIR IMMERSION	1.6E-12	2.2E-12
GROUND SURFACE	6.3E-08	8.1E-08
TOTAL:	1.4E-04	2.1E-03

DOSE TO THE MAXIMALLY EXPOSED INDIVIDUAL BY RADIONUCLIDE FOR ALL PATHWAYS

RADIONUCLIDE	EFFECTIVE DOSE EQUIVALENT (mrem/y)	DOSE EQUIVALENT TO THE ORGAN WITH THE HIGHEST DOSE ENDOSTEUM (mrem/y)
SR-90	6.2E-05	6.8E-04
AM-241	7.9E-05	1.4E-03
TOTAL :	1.4E-04	2.1E-03

EFFECTIVE DOSE EQUIVALENT AS A FUNCTION OF DISTANCE IN THE DIRECTIONS OF THE MAXIMALLY EXPOSED INDIVIDUAL FOR ALL RADIONUCLIDES AND ALL PATHWAYS

DIRECTION : NORTH

DISTANCE (meters)	EFFECTIVE DOSE EQUIVALENT (mrem/y)
1900	1.4E-04
3000	6.0E-05
10000	6.0E-06
80000	1.0E-07

EFFECTIVE DOSE EQUIVALENT AS A FUNCTION OF ALL DISTANCES AND ALL DIRECTIONS FOR ALL RADIONUCLIDES AND ALL PATHWAYS

DIRECTIONS:	N	NNE	NE	ENE	E	ESE	SE	SSE
DISTANCE (METERS):								
1900	1.4E-04	5.6E-05	3.7E-05	2.4E-05	2.0E-05	2.5E-05	3.4E-05	2.1E-05
3000	6.0E-05	2.5E-05	1.7E-05	1.1E-05	9.5E-06	1.2E-05	1.6E-05	1.0E-05
10000	6.0E-06	3.2E-06	2.4E-06	1.7E-06	1.4E-06	1.9E-06	2.7E-06	1.8E-06
80000	1.0E-07	7.2E-08	6.1E-08	4.1E-08	3.6E-08	5.7E-08	1.0E-07	7.8E-08

	S	SSW	SW	WSW	W	WNW	NW	NNW
DISTANCE (METERS):								
1900	7.5E-06	5.0E-06	4.5E-06	4.2E-06	5.8E-06	8.3E-06	2.0E-05	1.0E-04
3000	3.6E-06	2.4E-06	2.1E-06	2.0E-06	2.7E-06	3.8E-06	9.4E-06	4.4E-05
10000	6.1E-07	3.9E-07	3.2E-07	3.2E-07	4.3E-07	5.6E-07	1.4E-06	4.5E-06
80000	2.7E-08	1.4E-08	1.1E-08	1.1E-08	1.4E-08	1.5E-08	4.1E-08	8.5E-08

METEOROLOGICAL AND PLANT INFORMATION SUPPLIED TO PROGRAM----

AGE VERTICAL TEMPERATURE GRADIENT OF THE AIR (DEG K/METER)	
N STABILITY CLASS E	0.0728
IN STABILITY CLASS F	0.1090
IN STABILITY CLASS G	0.1455

PLUME DEPLETION AND DEPOSITION PARAMETERS

NUCLIDE	GRAVITATIONAL FALL VELOCITY (METERS/SEC)	DEPOSITION VELOCITY (METERS/SEC)	SCAVENGING COEFFICIENT (1/SEC)	EFFECTIVE DECAY CONSTANT IN PLUME (PER DAY)
SR-90	0.000	0.00180	0.940E-05	0.000E+00
AM-241	0.000	0.00180	0.940E-05	0.000E+00

FREQUENCY OF ATMOSPHERIC STABILITY CLASSES FOR EACH DIRECTION

SECTOR	FRACTION OF TIME IN EACH STABILITY CLASS						
	A	B	C	D	E	F	G
N	0.0060	0.0120	0.0216	0.2296	0.2849	0.1474	0.2984
NNW	0.0171	0.0181	0.0226	0.3382	0.2369	0.1149	0.2522
NW	0.0430	0.0239	0.0738	0.5830	0.1810	0.0526	0.0428
WNW	0.0556	0.0492	0.0492	0.6130	0.1408	0.0614	0.0307
W	0.0746	0.0482	0.0746	0.6870	0.0816	0.0270	0.0070
WSW	0.1024	0.1288	0.1200	0.5552	0.0744	0.0096	0.0096
SW	0.1366	0.0636	0.1366	0.5722	0.0542	0.0094	0.0275
SSW	0.0881	0.0945	0.1622	0.6009	0.0473	0.0070	0.0000
S	0.1221	0.1907	0.0972	0.5610	0.0252	0.0000	0.0037
SSE	0.0940	0.1045	0.1082	0.6498	0.0411	0.0012	0.0012
SE	0.0558	0.0791	0.0827	0.6690	0.1062	0.0054	0.0019
ESE	0.0185	0.0203	0.0559	0.7229	0.1536	0.0254	0.0034
E	0.0234	0.0439	0.0643	0.5977	0.1857	0.0748	0.0102
ENE	0.0383	0.0383	0.0630	0.5607	0.2027	0.0901	0.0068
NE	0.0237	0.0473	0.0383	0.5412	0.2108	0.0988	0.0399
NNE	0.0106	0.0146	0.0370	0.3425	0.3624	0.1297	0.1032

FREQUENCIES OF WIND DIRECTIONS AND RECIPROCAL-AVERAGED WIND SPEEDS

WIND TOWARD	FREQUENCY	WIND SPEEDS FOR EACH STABILITY CLASS (METERS/SEC)						
		A	B	C	D	E	F	G
N	0.155	1.85	3.10	2.88	2.30	1.38	0.84	0.79
NNW	0.128	2.74	3.38	3.71	2.25	1.39	0.87	0.80
NW	0.049	2.64	2.48	1.69	1.79	1.19	0.83	0.77
WNW	0.019	2.47	1.81	1.45	1.58	0.88	0.77	0.77
W	0.017	3.31	2.21	1.49	1.62	0.77	0.77	0.77
WSW	0.013	1.69	1.33	1.32	1.41	0.77	0.77	0.77
SW	0.013	1.62	1.91	1.49	1.38	0.77	0.77	0.77
SSW	0.017	2.66	1.40	2.25	1.42	0.77	0.77	0.00
S	0.032	2.68	2.27	2.11	1.63	0.96	0.00	0.77
SSE	0.098	3.62	2.77	2.21	2.04	1.11	0.77	0.77
SE	0.129	3.70	3.25	2.92	1.96	1.02	0.77	1.19
ESE	0.068	3.17	2.58	2.58	1.76	0.87	0.81	0.77
E	0.045	2.03	1.88	2.75	1.50	0.82	0.77	0.77
ENE	0.051	2.41	3.19	2.15	1.51	0.84	0.79	0.77
NE	0.079	3.24	3.19	2.01	1.97	1.05	0.77	0.77
NNE	0.087	2.72	2.49	2.23	1.86	1.24	0.78	0.78

FREQUENCIES OF WIND DIRECTIONS AND TRUE-AVERAGE WIND SPEEDS

WIND TOWARD	FREQUENCY	WIND SPEEDS FOR EACH STABILITY CLASS (METERS/SEC)						
		A	B	C	D	E	F	G
N	0.155	3.14	3.97	4.42	4.04	2.57	0.99	0.82
NNW	0.128	3.89	3.70	4.24	3.61	2.39	1.10	0.86
NW	0.049	3.17	3.29	2.45	2.69	1.83	1.02	0.77
WNW	0.019	3.36	2.81	2.34	2.66	1.08	0.77	0.77
W	0.017	3.55	3.08	2.42	2.62	0.77	0.77	0.77
WSW	0.013	2.57	2.06	2.30	2.21	0.77	0.77	0.77
SW	0.013	2.22	2.31	2.21	2.12	0.77	0.77	0.77
SSW	0.017	2.71	1.93	2.65	2.13	0.77	0.77	0.00
S	0.032	3.29	2.97	2.84	2.35	1.28	0.00	0.77
SSE	0.098	4.03	3.31	2.77	3.01	1.64	0.77	0.77
SE	0.129	3.96	3.60	3.49	2.85	1.44	0.77	1.67
ESE	0.068	3.39	3.31	3.15	2.56	1.05	0.90	0.77
E	0.045	2.37	2.46	2.86	2.23	0.95	0.77	0.77
ENE	0.051	2.78	3.42	2.63	2.17	0.97	0.87	0.77
NE	0.079	3.47	3.42	3.02	2.77	1.62	0.77	0.77
NNE	0.087	2.81	3.22	3.41	2.82	1.90	0.79	0.82

Data Required for Determination of Source Terms for NESHAP Modeling

Source Name: Portable Ventilation Units

ID: PVU-01 Through 10

Annual System Throughputs:

Total Curies or Maximum Concentration*:

** 7.2875 TOTAL CURIES ⇒ BASED ON CONSERVATIVE ASSUMPTIONS, CURIES IN SOLID STATE.

2 PVU'S DO NOT VENT DIRECTLY TO ATMOSPHERE AT ANY TIME

OTHERS OPERATE < 400 HRS EACH PER YEAR

Throughput Volume:

Ventilation Rates/Hours of Operation:

** 1000 CFM / < 400 HOURS PER UNIT AVERAGE

Physical State of Source (Sealed/Solid/Powder/Liquid/Gas)**:

CAN BE ANY STATE - BECAUSE THESE ARE PORTABLE VENTILATION SYSTEMS THEY ARE USED THROUGHOUT THE PLANT TO SUPPORT VARIOUS ACTIVITIES

Controls (If banks of HEPAs, indicate how many):

1 BANK EACH

*Can be gross alpha/beta. If volatiles such as H-3, C-14 or I-129 are present, list separately.

**For liquids, indicate if temperatures exceed 100 C.

** REPRESENTATIVE AVERAGE FOR 1988 & 1989 (INDOOR VENTING)

DW:87:0560

Department of Energy
Idaho Operations Office
West Valley Project Office
P.O. Box 191
West Valley, NY 14171

DEC 31 1987
WVNS CO.

December 30, 1987

BARNES
BONENBERGER
BORISCH
CHRISTENSEN
CONNORS
CWYNAR
DOOLEY
DUKER
ENGLERT, A.
GESSNER
GARLAND
GREENQUIST
HARWARD
HERNANDEZ
HOFFMAN, W.C
HOWARD, L.L.
HUGHES, R.
HUGHES, T.
HUMMEL
HUMPHREY
KEEL, P
KEEL, R
KLANIAN
KNABENSCHUH
KRAUSS
LAWRENCE
LIKOVICH
LORME
MARCHETTI
McVAY
MILLER, J.F.
PALMIERI
PARKINSON
PAUL
PLOETZ, D.J
PLOETZ, D.K
POPE
REPP
ROBERTS, C.
RYAN
SCHULZ
SGROI, M.H.
SHAFFNER
SHAKOOR
SHUGARS
SWENSON
VALENTI
WINKLER
ENGLERT

Mr. J. E. Krauss, President
West Valley Nuclear Services Co., Inc.
P. O. Box 191
West Valley, New York 14171

SUBJECT: Interim NESHAPS Approvals to Construct/Modify Sources of Radionuclides/Liquid Waste Treatment System

Dear Sir:

Enclosed are the interim approvals from the U. S. Environmental Protection Agency, Region II to construct/modify the following sources of radionuclide emissions at the West Valley Demonstration Project:

WVDP - 587 - 01	Outdoor Ventilated Enclosures
WVDP - 687 - 01	Liquid Waste Treatment System

Final approval will be issued once the WVDP dose equivalent estimate have been confirmed by the EPA through an independent computer run of the EPA computer code AIRDOS-EPA.

With the receipt of the above mentioned approval and in compliance with the terms and conditions of these approvals, you are hereby authorized to proceed with the startup of the subject systems.

Sincerely,

W. W. Bixby, Director
West Valley Project Office

Enclosures

cc: J. P. Hamric, DOE-ID
J. H. Barry, DOE-ID
R. G. Spaunburgh, NYSERDA

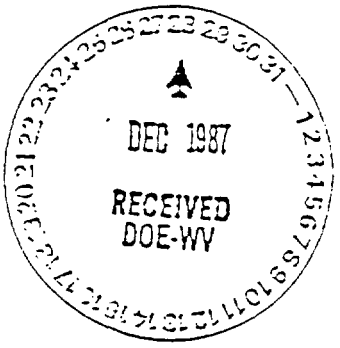
TGA:320:87 - 0025:87:01

TGA:tl

RECEIVED
JAN 5 1988

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION II
26 FEDERAL PLAZA
NEW YORK, NEW YORK 10278

DEC 2 2 1987



Dr. Willis W. Bixby
Director
West Valley Demonstration Project
U.S. Department of Energy
West Valley Project Office
West Valley, New York 14171

Dear Dr. Bixby:

In accordance with the provisions of the Clean Air Act, as amended (42 U.S.C. §7401 et seq.) the Environmental Protection Agency (EPA) has reviewed the following applications to construct/modify sources of radionuclide air emissions at the West Valley Demonstration Project site:

WVDP - 587-01 Outdoor Ventilated Enclosures

WVDP - 687-01 Liquid Waste Treatment System

Pursuant to Title 40, Code of Federal Regulations, Part 61, National Emission Standards for Radionuclide Emissions from Department of Energy Facilities, interim approvals to construct the aforementioned sources at the West Valley Demonstration Project, are enclosed with this letter.

These interim approvals to construct/modify shall take effect immediately upon receipt by the West Valley Demonstration Project Office.

These interim approvals are based upon a technical review of submissions included with your letter dated August 4, 1987 (general information Sections B, C, D) and letters of application to construct/modify dated October 8, 1987 (Liquid Waste Treatment System and Outdoor Ventilated Enclosures). Final approval will be issued once the WVDP dose equivalent estimates have been confirmed by the EPA through an independent computer run of the EPA computer code AIRDOS-EPA.

If you have any questions regarding this matter, please contact Paul A. Giardina, Regional Radiation Representative, at (212) 264-4418.

Sincerely,

Christopher J. Daggett
Regional Administrator

Enclosures

cc: Thomas C. Jorling, Commissioner
New York State Department of Environmental Conservation

David Axelrod, Commissioner, New York State Department of Health

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION II
26 FEDERAL PLAZA
NEW YORK, NEW YORK 10278

WVDP-587-01
Outdoor Ventilated Enclosures
Approval to Construct/Modify
Sources of Airborne Radionuclide Emissions

In compliance with provisions of the Clean Air Act, as amended (42 U.S.C. §7401 et seq.) the Department of Energy West Valley Demonstration Project Office is granted interim approval to construct/modify sources WVDP-587-01, located at the West Valley Demonstration Project Site in West Valley, New York. This approval is granted in accordance with the plans and materials submitted with the applications and with Federal Regulations governing the National Emission Standards for Hazardous Air Pollutants (40 CFR Part 61), Subpart H. Any conditions attached to this document are considered part of this approval.

Failure to comply with any conditions or terms set forth in this approval may result in sanctions available under the authority of Section 1-604 of Executive Order 12088 as well as enforcement procedures established by the Clean Air Act.

This approval to construct/modify grants no relief from the responsibility for compliance with other applicable provisions of Federal regulations. This approval shall be effective immediately after receipt of the approval to construct/modify by the applicant.

Dated December 22, 1987

Regional Administrator

Permit Conditions

I. Emergency Notification

A. In the event of an accidental/unplanned release of radionuclides which leads to an air emission that may cause the standards of 40 CFR 61 to be exceeded; or may result in a health threat to the public; the DOE-WVDP shall make timely notification to state, local and Federal agencies.

B. Initial phone notification should include the time of the accident/release; location of accident/release; estimate of quantity release; emergency steps taken to contain/control the release; type of assistance needed; and the name and title of person reporting the incident. A brief written summary of the event shall be submitted to Director, Air & Waste Management Division (Attn: Regional Radiation Representative) within 30 days of the event.

C. EPA Phone Notification - In Order of Preference

1. Region II - Regional Radiation Representative
   Paul A. Giardina
   Work - 212-264-4418
   After Hours - 201-548-8730

2. Region II - Radiation Safety Officer
   Shawn W. Googins
   Work - 212-264-6459
   Home - 201-846-0489

3. Region II - Health Physicist
   Larainne Koehler
   Work - 212-264-0546
   Home - 201-627-0018

4. Region II - 24 Hour Emergency Hotline
   201-548-8730

D. New York State Radiological Health Contact

1. New York State Warning Point
   518-457-2200

2. Backup Number (New York State Police)
   518-456-6811

3. Director, New York State Bureau of Environmental Radiation Protection
   Dr. Karim Rimawi
   Work - 518-458-6461
   Duty - 518-439-0865

4. Chief, New York State Environmental Radiation Section
   William Condon
   Work - 518-458-6459
   Off-Duty - 518-463-3704

II. Permit Expiration

A. This interim approval to construct/modify will remain in effect until final approval is granted by the Regional Administrator or his designee. The approval to construct/modify is not transferable to another owner/operator.

B. The Department of Energy (DOE) may submit to the Regional Administrator (Region II Air & Waste Management Division Director) a written application for a determination of whether actions intended to be taken by the DOE/WVDP Office constitute a modification or construction of a source subject to the standard. The Regional Administrator will notify the owner/operator of his determination within 30 days after receiving sufficient information to evaluate the application (40 CFR 61.06).

C. If intended actions to be taken by the WVDP are determined to constitute construction/modification which effects existing permitted sources, the new permit and conditions shall supersede and/or amend the existing permit.

D. Updates in notification requirements and phone contacts supersede previous permit conditions.

III. Notification of Startup

A. The owner/operator of each stationary source which will have an initial startup after the effective date of the standard shall provide written notification to the Administrator as follows:

1. The 30-60 day notification required for the WVDP-587-01 sources (Outdoor Ventilated Enclosures) is waived.

2. Notifications of the WVDP-587-01 source startups are waived.

3. In lieu of notification requirements 1 and 2 above, the WVDP shall maintain records of OVE usage and monitoring of airborne emissions during operations. A summary of OVE usage and emissions shall be included in WVDP's yearly report of emissions which is submitted to EPA. A copy of this report shall be submitted directly to the Regional Office.

IV. Facility Operation/Maintenance

The facility owner/operator shall maintain all equipment, facilities, and systems installed or used to achieve compliance with the standard (40 CFR 61.92) in a manner consistent with good air pollution control practices for minimizing emissions. Operations, testing and maintenance of such air pollution control systems shall be conducted as noted in the pertinent general information sections (Sections B, C, and D) included with your submissions and letter of August 4, 1987 and application dated October 8, 1987. These procedures are acceptable methods in the conduct of a good air pollution control program. Records of maintenance, inspection, testing, repair, monitoring data, and standard operating procedures for conducting such activities shall be maintained pursuant to 40 CFR 61.12 (c).

V. Severability

The provisions of this approval to construct/modify are severable, and, if any provision of this approval to construct/modify is held invalid, the remainder of this approval to construct/modify shall not be affected thereby.

VI. Other Applicable Regulations

The owner/operator of the West Valley Demonstration Project shall construct and operate the proposed source in compliance with all other applicable provisions of 40 CFR Parts 52, 60, and 61.

VIII. Agency Notification

A. All correspondence as required by this approval to construct/modify shall be sent to:

U.S. Environmental Protection Agency
Director, Air & Waste Management Division
Attention: Regional Radiation Representative
26 Federal Plaza
New York, New York 10278

REQUEST FOR APPROVAL TO CONSTRUCT OR MODIFY
SOURCES OF RADIONUCLIDE EMISSIONS (40 CFR 61, SUBPART H)

I. NAME AND ADDRESS OF APPLICANT

U.S. Department of Energy
West Valley Demonstration Project Office
P.O. Box 191
West Valley, New York 14171-0191

Operating Contractor:

West Valley Nuclear Services Co., Inc.
P.O. Box 191
West Valley, New York 14171-0191

II. NAME AND LOCATION OF SOURCE

Name: Portable Ventilation Units

Location: West Valley Demonstration Project
Rock Springs Road
West Valley, New York

III. RELEASE POINT INFORMATION

Emission Point IDs:	PVU 01 through PVU 10
Ground Elevation (Ft MSL):	Variable
Stack Height (Ft):	Variable
Height Above Structure (Ft):	Variable
Inside Dimensions (Inches):	5 and 10 diameter
Exit Temperature* (°F):	70°
Exit Velocity (Ft/Sec):	30-61.2
Exit Flow Rate (ACFM):	500-2000

*Exit temperature is for PVUs used within areas served by Main Plant Ventilation. For other applications, exit temperature is assumed to be the same as the ambient air temperature.

IV. TECHNICAL INFORMATION ABOUT SOURCE

A. Nature, Size, and Design Capacity

Ten (10) various portable electric ventilation units currently exist at the WVDP to support and supplement existing ventilation systems (i.e., Main Plant Ventilation, VOG, etc.) for work activities requiring additional control of airborne radioactivity. Table 1 gives a list of these units and their rated capacity. Attachments 1 through 3 show the general design details, dimensions, descriptions, and WVDP general requirements of the various models listed in Table 1. All units described above can be operated at less than design capacity. Typically, HEPA filters used with these units are flow rated at 500, 1,000 or 1,500 CFM.

B. Method of Source Operation and Description of Emission Controls

These portable ventilation units are normally operated to provide additional ventilation to support work activities performed within temporary containment tents or airlocks located in areas ventilated by the Main Plant Ventilation System. Another application is to use the units to ventilate temporary containments erected to support work where the potential for airborne contamination exists within the site restricted area.

All units are equipped with a spark arrestor, prefilter and a HEPA filter which is DOP-tested at regular intervals per site procedures. The effluent is monitored for radioactivity with an alpha/beta continuous air monitor either in the area being ventilated or at the point of discharge. Differential pressure across the HEPA filter is monitored by a magnehelic.

C. Radioactive Emission Estimates

Emission estimates are based on ground-level releases of air at 75 percent of the WVDP derived concentration guide (DCG) limits for an unidentified release (i.e., 75 percent of 2 E-14 µCi/mL gross alpha, 75 percent of 9 E-12 µCi/mL gross beta). Americium-241 is assumed to be the alpha activity and Sr-90 the beta activity. Annual doses are based on operation of the units at full capacity (500-2000 ACFM) for eight hours per day, 120 days per year. The dose to the maximally exposed off-site individual from one 2000 CFM source is estimated to be 1.7 E-07 rem/year using WVDP generated unit dose factors for continuous ground-level releases (Table 2). Maximum whole body and organ doses were also calculated by the CAAC (CCC-476) version of the AIRDOS-EPA dispersion model and also are listed in Table 2.

The reader is directed to the general information previously submitted by WVDP, and specifically to Section E for the unit dose conversion factors calculated using CAAC and to Section F for unit dose factors based on the WVDP site specific dispersion model. In each case, sources emanating from PVUs are modeled as ground level sources since the release points are generally not high enough to negate wake effects caused by the Process Building or other nearby structures.

Table 3 shows the estimated annual dose for ground level releases given that all PVUs on-site were in continuous operation and releasing gross alpha and gross beta activity at 75 percent of the DCG limits as previously discussed. It is readily apparent that the maximum individual effective dose of 1.7 E-04 mrem in the case of one 2000 CFM unit or 1.3 E-02 mrem for all PVUs in continuous operation represents only 6.8 E-04 and 5.2 E-02 percent of the 25

mrem EPA guideline for off-site annual dose, respectively. Similarly the critical organ percentage is 3.8 E-06 and 2.1 E-04, respectively, given the 75 mrem critical organ annual limit.

In rare instances, releases may exceed the DCG 75% limit without operations being secured (e.g. recovery after a major process upset, or to provide for additional personnel safety should additional time be required to stop a work activity where unexpectedly high airborne levels are presently).

Based on the above discussion, the limiting release from any one or all PVUs collectively before any EPA guidelines are exceeded is 1.8 E-03 curies of Am-241 combined with 8.0 E-01 curies of Sr-90. The limiting dose would be 75 mrem to the endosteal bone. The whole body dose for this release is calculated as 6.6 mrem. Backcalculating from these maximum release quantities to determine the release concentration for a 2000 CFM PVU operated for 120 days gives an Am-241 release concentration of 5.52 E-10 µCi/mL and 2.45 E-07 µCi/mL for Sr-90. These values represent 2.7 E+04 times the Am-241 and Sr-90 DCG which could be released via this emission pathway before exceeding the EPA recommended guidelines of 75 mrem to the critical organ. This calculation demonstrates the extreme conservatism in limiting releases to 75% of DCG values when these emissions are used to calculate off-site doses. The reader is cautioned that these values are subject to change if the dose to the critical organ is calculated based upon the effective whole body dose equivalent system discussed in ICRP Volumes 26 and 30.

In summary, the analyses presented here shows that, under normal operating conditions, portable ventilation units operated at WVDP will limit environmental releases of radioactivity to ALARA levels through combination of good engineering practice and operational limitations.

TABLE 1

LIST OF PORTABLE VENTILATION UNITS AT WVDP

EPA Designation	Manufacturer	Model No.	Serial No.	Rated Capacity (SCFM)
PVU 01	Nuclear Power Outfitters (NPO)	E2000	2P2F108601	2000
PVU 02	NPO	E2000	2P2F108602	2000
PVU 03	NPO	E2000	2P28108603	2000
PVU 04	Elwood Nuclear Services (ENS)	8650-500	85-1029	500
PVU 05	NPO	E2000 PC	2P3F38711	2000
PVU 06	ENS	ENS-2000	6021	2000
PVU 07	Bartlett Nuclear	Air-Pak	N/I+	2000
PVU 08	ENS	ENS-2000	6022	2000
PVU 09	NPO	E1000 PC	1P2A033401	1000
PVU 10	NPO	E1000 PC	1P04986-1	1000

+N/I - None Identified

TABLE 2

ESTIMATED MAXIMUM ANNUAL DOSES FOR RELEASES FROM OPERATION OF A 2000 CFM PORTABLE VENTILATION UNIT WITH A SINGLE HEPA FILTER[1]

Nuclide[2]	Activity Release (Ci/yr)	WVDP Effective Dose (Rem)	CAAC Whole Body Dose (Rem)	CAAC Critical Organ Dose (Rem)[3]
Sr-90	2.2 E-05	1.6 E-07	1.3 E-07	7.3 E-07
Am-241	4.9 E-08	1.0 E-08	4.9 E-08	1.3 E-06
	TOTALS	1.7 E-07	1.8 E-07	2.1 E-06

[1] Operational time is 960 hours per year.

[2] Sr-90 is used to represent the gross beta activity and Am-241 is used to represent the gross alpha activity to provide the most conservative estimate of the radiological impacts associated with air emissions from PVUs.

[3] The critical organ for Sr-90 and Am-241 is endosteal bone.

TABLE 3

ESTIMATED DOSE RESULTING FROM CONTINUOUS OPERATION
OF ALL WVDP PVUs AT 75 PERCENT OF DCG LIMIT[1]

Nuclide[2]	Activity Release (Ci/yr)	WVDP Effective Dose (Rem)	CAAC Whole Body Dose (Rem)	CAAC Critical Organ Dose (Rem)[3]
Sr-90	1.7 E-03	1.2 E-05	1.0 E-05	5.6 E-05
Am-241	3.7 E-06	7.8 E-07	3.7 E-06	1.0 E-04
	TOTALS	1.3 E-05	1.4 E-05	1.6 E-04

[1] Note: Releases are based on PVU rated capacity listed in Table 1 which is usually higher than the normal applied usage at WVDP.

[2] Sr-90 is used to represent the gross beta activity and Am-241 is used to represent the gross alpha activity to provide the most conservative estimate of the radiological impacts associated with air emissions from PVUs.

[3] The critical organ for Sr-90 and Am-241 is endosteal bone.

ATTACHMENT I

GENERAL SPECIFICATIONS APPLICABLE

TO ALL PORTABLE VENTILATION UNITS

The 1000 "PLUS"

PORTABLE VENTILATION/FILTER SYSTEMS

- CFM range from 500 to 2000 plus
- Truly portable in design
- Light weight and compact
- All air treatment solutions available
- Meets latest technical specifications

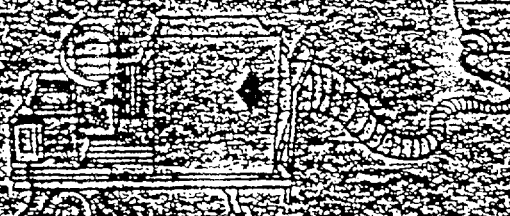


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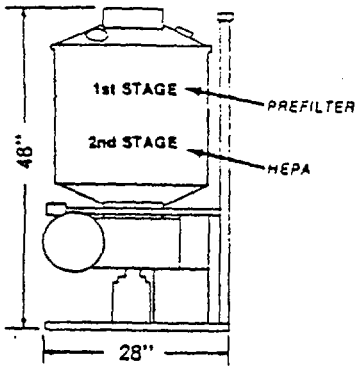
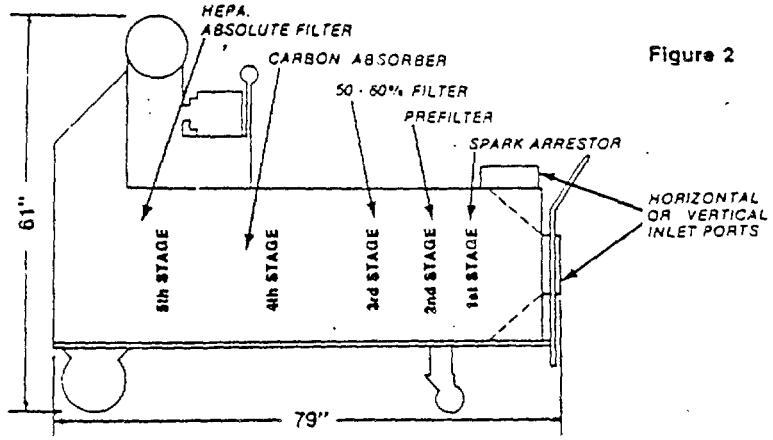
Figure 1

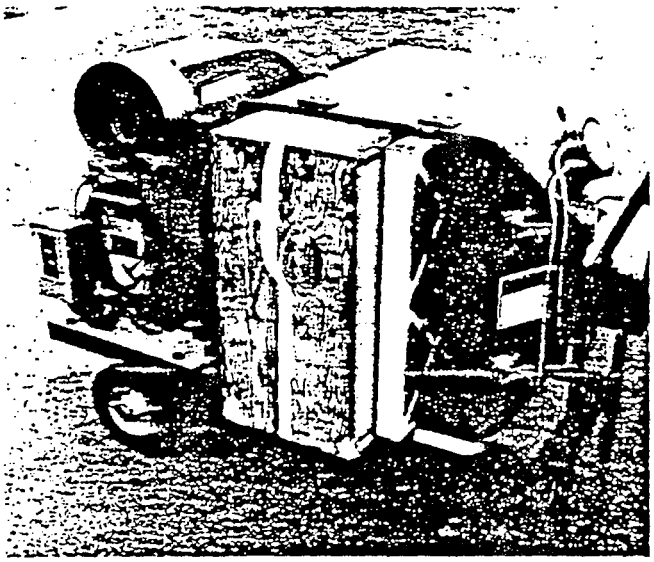


E 1000 PC, Ultra-Compact Portable Ventilation Unit. (Standing vertically with carriage removed.)

Figure 2

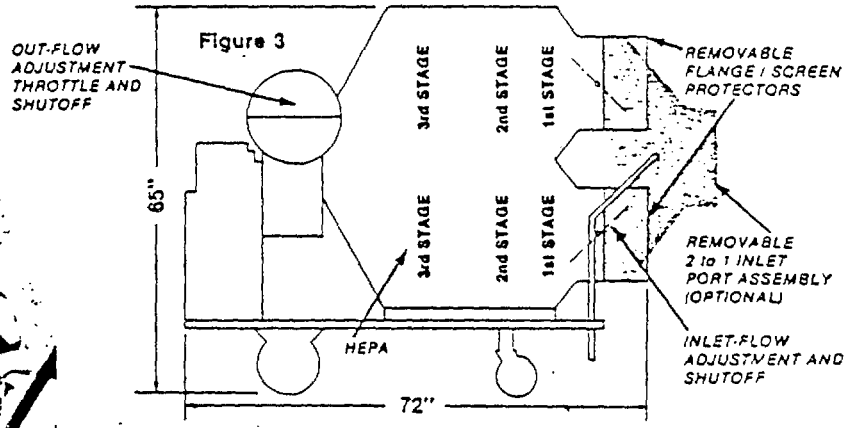


E 1000 (VQ), Multi-Housing Ventilation Systems with carbon absorbers.

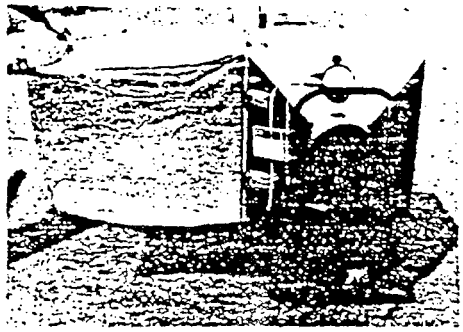


E 1000 PC Model with 2 filter stages, 99.97% HEPA and Prefilter.

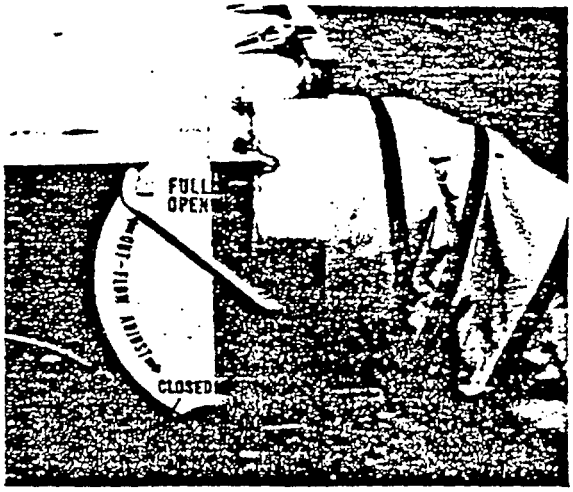
Figure 3



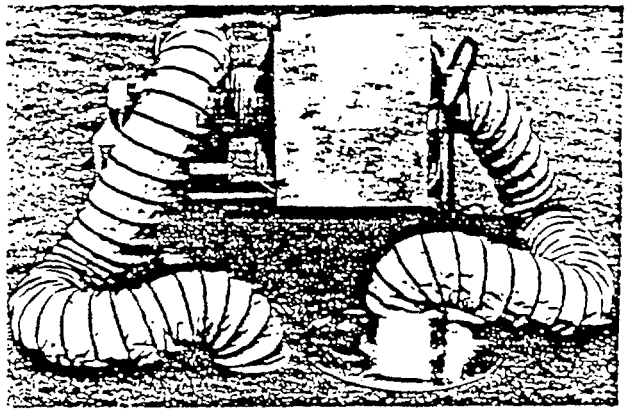
E 2000 PT, 2000 "Plus" CFM Portable Ventilation System.



Bag-out availability and stainless steel housings standard with all units.



Outflow (and inlet) Adjustment Throttle as recommended by ANSI / ASME. Reduce or shutoff airflow without harming motor / blower unit.



Accessories, including flexible ducting, steam generator port flanges and many more. (See listing on back page.)

The Recommendable Unit

NPO's 1000 "Plus" CFM *Portable* Ventilation / Filter System using the (P) Housing and (A) or (B) Blower (see back page for ordering information).

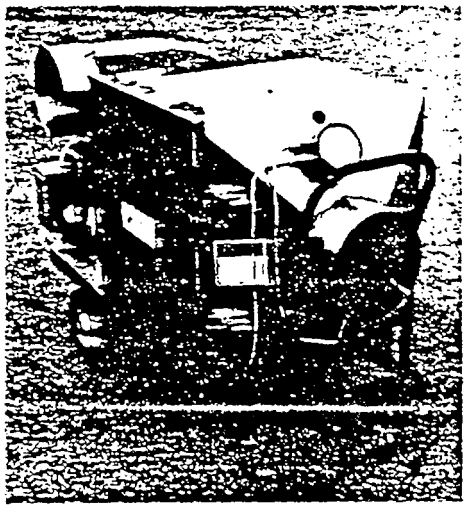
- Filter Trains up to 3 stages: Prefilter, spark arrestor, moisture separator and/or 50-60% filter with the HEPA.
- 2 or 3 HP Motor/Blower with 1500-2500 CFM free-air. Up to 7" wg. static pressure at 1000 CFM., and 10" wg. with 750 CFM (Blower/Motor (A)). See Blower/Motor Chart.
- Weighs approx. 300 lbs. with balanced cart for easy portability.
- Compact for access to almost every area. Overall dimensions 28" x 40" x 63". Can be mounted vertically. Easily removed from mobile cart for permanent or low profile installations. (28" x 28"x 63")
- Outflow Adjustment Throttle as recommended by ANSI / ASME to control flow and/or static pressure across filter train. Heavy duty motor will not be harmed by low air-flow conditions. Designation (T) in Model No.
- Hinged Access Door with bag-out feature standard (Bag-out not required for unit to operate). Prefilter access door on top optional—see drawing, Model E 1000 P. Top door designated as (D) in Model No.
- Viewing Glass Window and Light for accessing status of prefilter. (Optional) Designation (W) and/or (L) respectively in Model No.
- Static Pressure Gage with read-out switching for each filter stage.
- Facilities for filter efficiency testing (DOP).

Filter Train Selection

NPO offers all possible filtering and air treatment devices. These devices are manufactured and tested to meet the standards of the nuclear industry. (See back page for ordering information).

- HEPA 99.97% efficiency (absolute) filter. 24" x 24" x 11½" with neoprene or liquid seal.
- Carbon Absorbers. 24" x 24" x 16" or 24" x 24" x 29" (Two units in series provides greater "transient times" for more effective absorption).
- 50-60% Filters (Typically required upstream to carbon absorbers). 24" x 24" x 5¾"
- Moisture Separators with drain mechanism 99+ % effective in removing moisture. 24" x 24" x 5½"
- Prefilters - disposable filters to take the bulk of the dust and contamination from the air. 24" x 24" x 2" (or 4")
- Spark Arrestor - washable filters to trap welding sparks and aspirated oils and grease. 24" x 24" x 2"
- Filter

Manufacturer's specification bulletins available upon request.



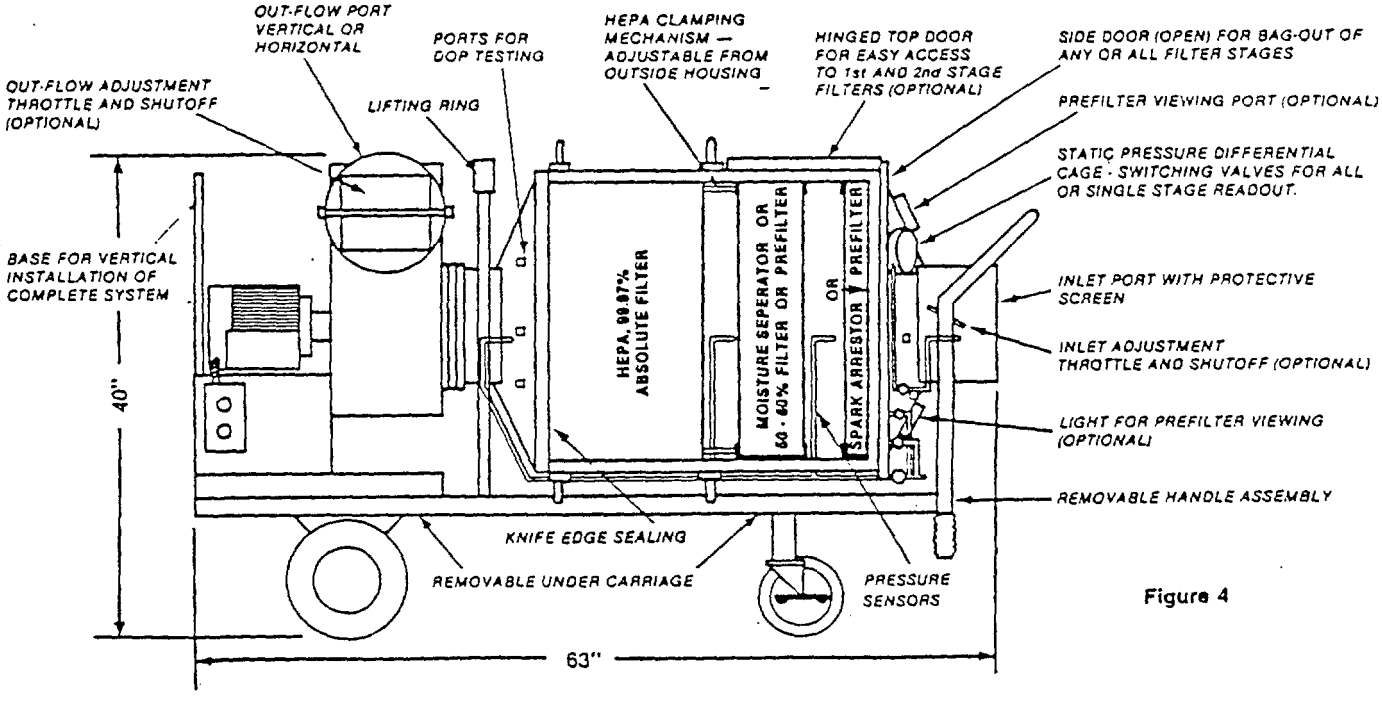


Figure 4

Portable Ventilation System — The Recommendable Unit

Model E 1000 P with 3 filter stages (optional 2 or 3 — see ordering information).

Adding Up the Static Pressure Losses for Blower Selection

Static Pressure Losses through Filter Stages

Prefilter	.15" Wg.*
Spark Arrestor	.15" Wg.*
60% Filter (Pre-)	.45" Wg.*
Moisture Separator	.80" Wg.*
Charcoal Absorber	1.10" Wg.*
HEPA Filter	1.00" Wg.*

*Clean filter at 1000 CFM

Note:

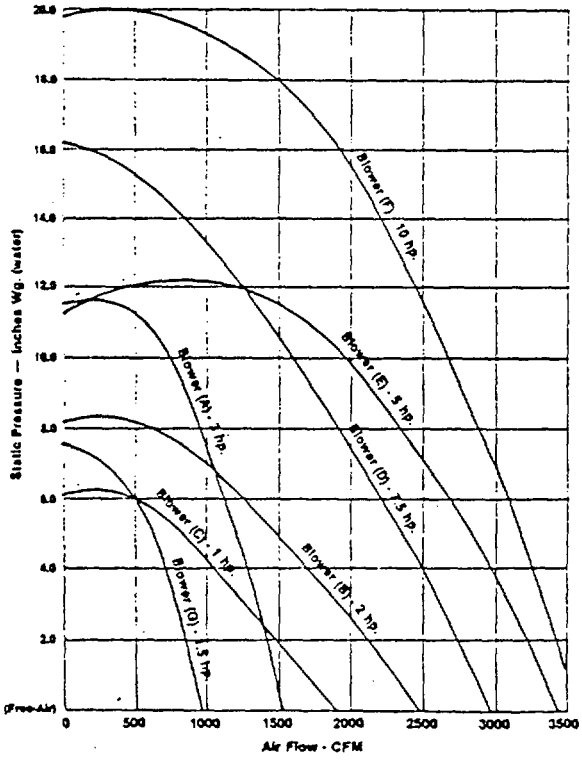
These values are approximate and can easily double if filters are dirty. The prefilter(s) can increase in static back pressure many times clean value and must be cleaned and/or replaced frequently. Internal system static pressure losses, without filters, can be up to 1" Wg.

X 2

Static Pressure Losses through Ducting (Flexible)

Duct Sizes	6"	8"	10"	12"	16"
Pressure Losses in inches of Wg. per 100 ft. of flexible ducting at:					
500 CFM	5" Wg.	.6" Wg.	.2" Wg.	.1" Wg.	<.1" Wg.
1000 CFM	14" Wg.	2.5" Wg.	.7" Wg.	.3" Wg.	.1" Wg.
2000 CFM	>20" Wg.	10 " Wg.	2.5" Wg.	1.2" Wg.	.25" Wg.

Blower Selection Air Flow vs. Static Pressure



NPO recommends blower/motor (A) for most 1000 CFM applications. (A) blower gives high flow rates even with long inlet ducts, dirty filters, and multiple stage filter trains. Yet blowers B, D, E, or F may be needed in order to provide the higher flow rates that are desired with multiple steam generator ventilation and many stage filter trains. NPO ventilation units have available an adjustable outflow device - (optional) as recommended by ANSI / ASME N509-1980 to throttle down the flow or to maintain a constant flow and/or static pressure. Inlet-flow adjust throttles are also available.

To select correct blower/motor unit, determine the total operating static pressure in inches of wg. (water). Find calculated total static pressure losses on vertical column of chart. Locate, on the horizontal line, the nominal air flow in CFM desired at the calculated total static pressure losses. The horizontal and vertical intersection of these points yields the blower/motor recommendation. Various electric motor operating voltages are available. Specify voltage, single or three phase current and explosion proof requirements when ordering.

Systems for Every Application:

- **Contamination and hazard control**
- **Clean room environments**
- **Steam generator work**
- **Containments and glove bags** (See NPO's Product Bulletin)
- **Welding fumes and collection**
- **High humidity requiring moisture removal**
- **Gas removal with charcoal absorbers AND portability**

Design Features Include:

- Regardless of the filtering or air treatment requirement, NPO / PPI has it. HEPA, moisture separators, charcoal absorbers, spark arrestors, prefilters, etc.
- Blower / Motor selection from 1 HP to 10 HP with free air to 4000 CFM and Static Pressures to 17" wg at 1000 CFM.
- Five stainless steel housing sizes from the Ultra Portable (PC) Housing with 2 or 3 stages (figure 1) to Multiple Housings with 5 or 6 stages (figure 2). 2000 CFM Systems with 2 high housings, available in any configuration (figure 3).
- Positive sealing access doors with Bag-Out feature standard with all housings (bag not required for unit to function). Unique "Tape-seal" bags make filter change-out easy yet contamination free.
- Out-flow and Inlet-flow Adjust Throttles (optional) for complete control of air-flows and/or static pressures - ANSI / ASME recommended.
- Multiple Inlet Ports and Steam Generator Flange Ports available
- Gage(s) for continuous reading of static pressure across every filter stage.
- Facilities for measuring the efficiency (DOP) of every stage in the filter train.
- *All the above features and portability too* (see back page for system selection and ordering information).

Systems Ordering Information

T[illegible]000 "Plus" CFM Portable Ventilation Unit- "The Recommendable System" (see Figure 4)

E 1000 P ( ) ( ) (see Housing Accessory Listing below)

Filter Options	Blower/Motor Options
(-1) Prefilter and HEPA only	(A-110) A Blower with
(-2) Spark Arrestor, Prefilter and HEPA	(A) 110 volt motor
(-3) Prefilter, Moisture Separator and HEPA	(B)
(-4) Prefilter, 60% Filter (Pre) and HEPA	(C) see Blower/Motor
	(E) Selection Table

Ultra-Compact Portable Ventilation Units (see Figure 1)

E 500 PC (-1) ( ) (see Housing Accessory Listing below), size 40" x 20" x 28" - 500 CFM rated*

E 1000 PC (-1) ( ) (see Housing Accessory Listing below), size 48" x 28" x 28" - 1000 CFM rated

**11" for Removable Carriage*

Filters — Blower/Motor Options

Includes Prefilter and HEPA only

(C), (G) → E 500

(A-100), (A), (B), (C) → E 1000

see Blower/Motor Selection Table

2000 "Plus" CFM Portable Ventilation Unit (see Figure 3)

E 2000 PT ( ) ( ) (see Housing Accessory Listing below)

Filter Options (2 sets required)	Blower/Motor Options
(-1) Prefilter and HEPA only	(D)
(-2) Spark Arrestor, Prefilter and HEPA	(E) see Blower/Motor
(-3) Prefilter, Moisture Separator and HEPA	(F) Selection Table
(-4) Prefilter, 60% Filter (Pre) and HEPA	

1000 "Plus" CFM Multi-Housing Ventilation Systems, with Carbon Absorbers (see Figure 2)

E 1000 ( ) ( ) (see Housing Accessory Listing below)

Modular Housing and Filter Train Options (maximum of 3 housings)	Blower/Motor Options
(V-1, Prefilter Housing with Prefilter and 60% Filter (Pre)	(A-100) see Blower/ (A) Motor (B) Selection (E) Table
(V-2, Prefilter Housing with Spark Arrestor, Prefilter and 60% Filter (Pre)	
(V-3, Prefilter Housing with 2 Prefilters	
Q-1, Carbon Absorber Housing with Carbon Absorber in 1st stage and HEPA in 2nd stage	
Carbon Absorber Housing with Carbon Absorbers in both 1st and 2nd stages	
H) For HEPA Absolute Filter when Q-2 Housing is required or when both Moisture separator and 60% filter stages are required upstream from Carbon Absorber stage.	

2000 "Plus" CFM Multi-Housing Ventilation Systems with Carbon Absorbers

E 2000 ( ) ( ) (see Housing Accessory Listing below)

Tandem (stacked) Modular Housings and Filter Train Options (maximum of 3 housing sets) See 1000 "Plus" CFM Multi-Housing Ventilation Systems for details.	Blower/Motor Options (D) (E) see Blower/Motor (F) Selection Table

Housing Accessories

(Letter prefixes complete systems model No. - list in same order as below).

(D, - Top Mounted Door for quick removal of prefilters (available in all P & V Housings)
T_0, - Outflow Adjustment Throttle and Shutoff
T_1, - Inlet-Flow Adjustment Throttle and Shutoff
W - Window only for viewing prefilter
L, - Lighted Prefilter (includes viewing glass and light)
I_2, - Multiple Inlet Port Adapters, (2) 10" Dia. ports
I_4, - Multiple Inlet Port Adapters, (4) 6" Dia. ports
Y) - "Y" Inlet Port Adapter for E 2000 PT, 2000 "Plus" CFM Portable Ventilation System. Couples dual inlets into a common inlet port.

Miscellaneous Accessories

E 100 SGA ( ) Steam Generator Flange Adapter - 10" Dia. Duct
E 100 SGB ( ) Steam Generator Flange Adapter - 16" Dia. Duct

Identify steam generator manufacturer or include drawing of generator opening.

E 101 DA	6" Flexible Ducting - 25 ft. lengths
E 101 DB	8" Flexible Ducting - 25 ft. lengths
E 101 DC	10" Flexible Ducting - 25 ft. lengths
E 101 DD	12" Flexible Ducting - 25 ft. lengths
E 101 DE	16" Flexible Ducting - 12 and 24 ft. lengths
E 101 DCA	Stainless Steel Canistor for 6" Dia. Ducting 25 ft. Length
E 101 DCB	Stainless Steel Canistor for 8" Dia. Ducting 25 ft. Length
E 101 DCC	Stainless Steel Canistor for 10" Dia. Ducting 25 ft. Length
E 101 DCD	Stainless Steel Canistor for 12" Dia. Ducting 25 ft. Length
E 101 DCE	Stainless Steel Canistor for 16" Dia. Ducting 24 ft. Length
E 102 BPCA	PVC Bag for E 500 Ultra Compact Portable Unit
E 102 BPCB	PVC Bag for E 1000 Ultra Compact Portable Unit
E 102 BP	PVC Bag for "Recommendable" Portable Unit
E 102 BV	PVC Bag for "V" Housing
E 102 BQ	PVC Bag for "Q" Housing
E 102 BH	PVC Bag for "H" Housing

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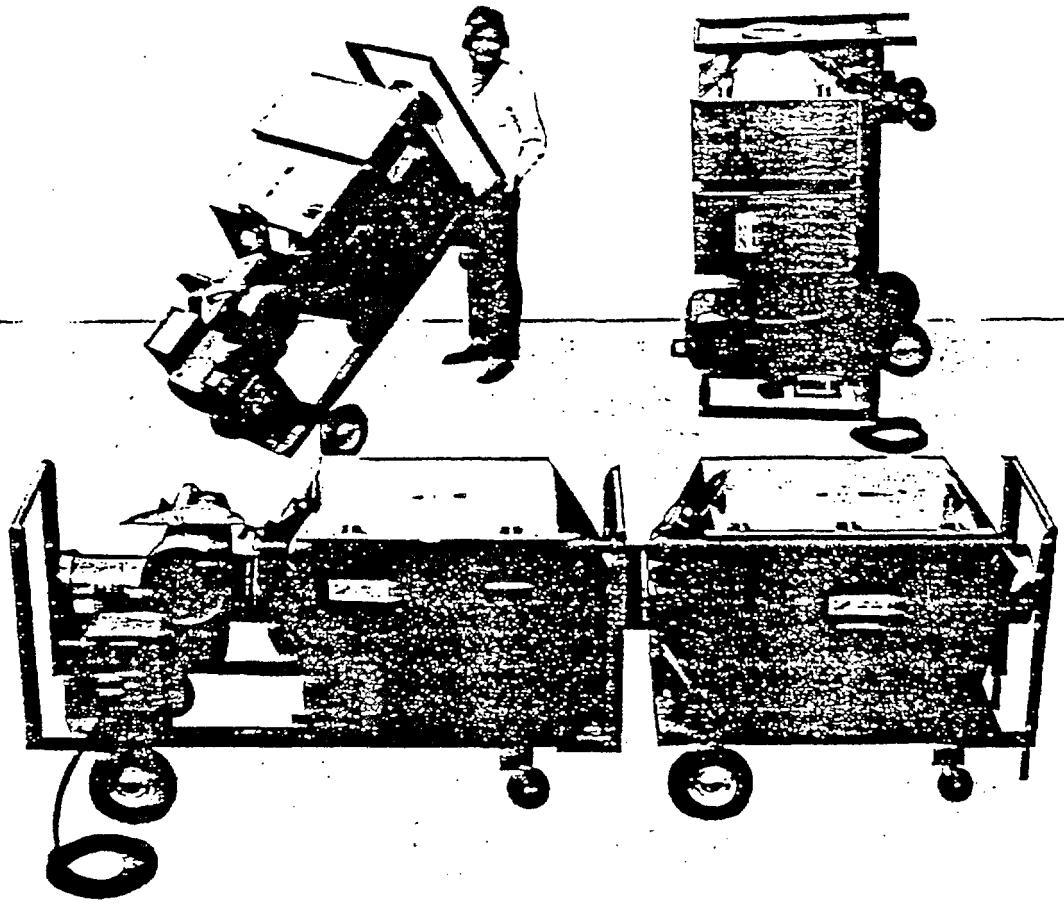
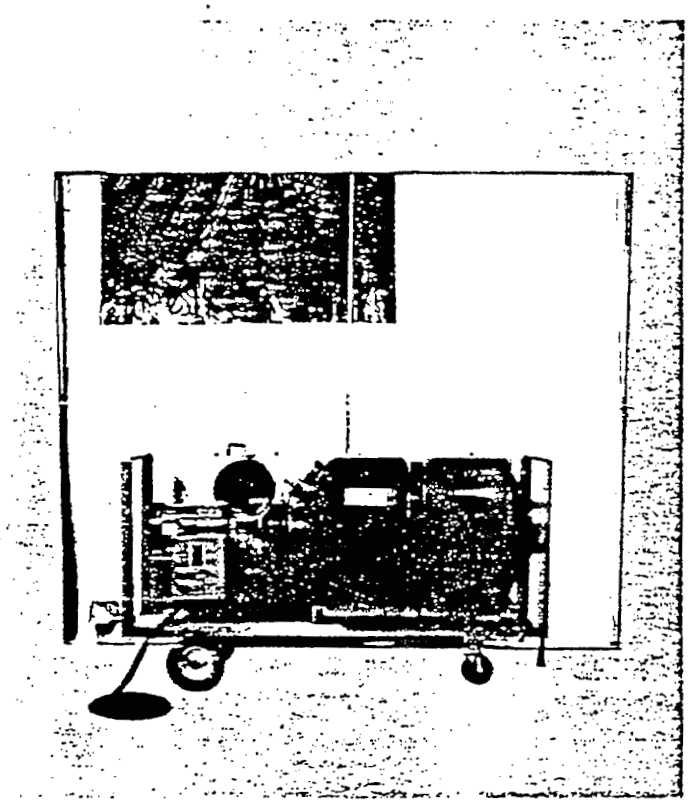


SYSTEMS FOR EVERY APPLICATION

- Particulate or gas removal
- CFM range from 500 to 4000 plus
- Truly portable in design
- Light weight and compact
- All air treatment solutions available
- Meets latest technical specifications

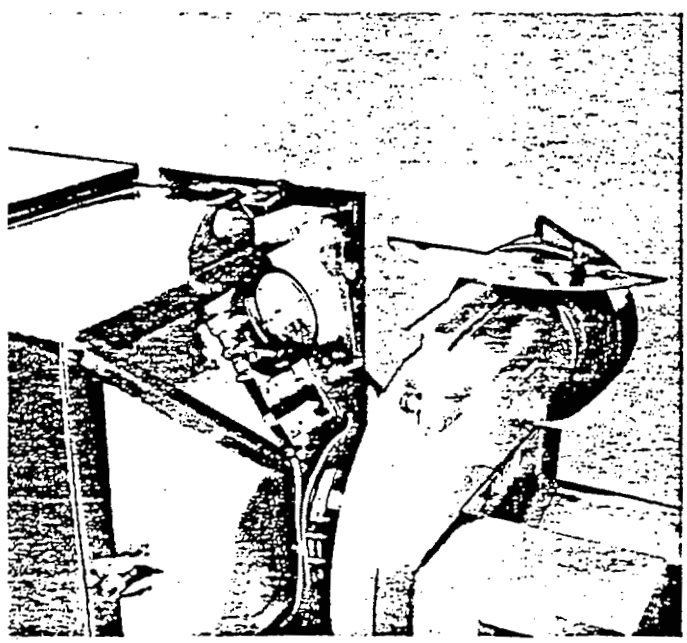
Portable Ventilation Systems

MODEL E 1000 PC, E 2000 PC — "CERTIFIED PORTABLE VENTILATION UNITS"

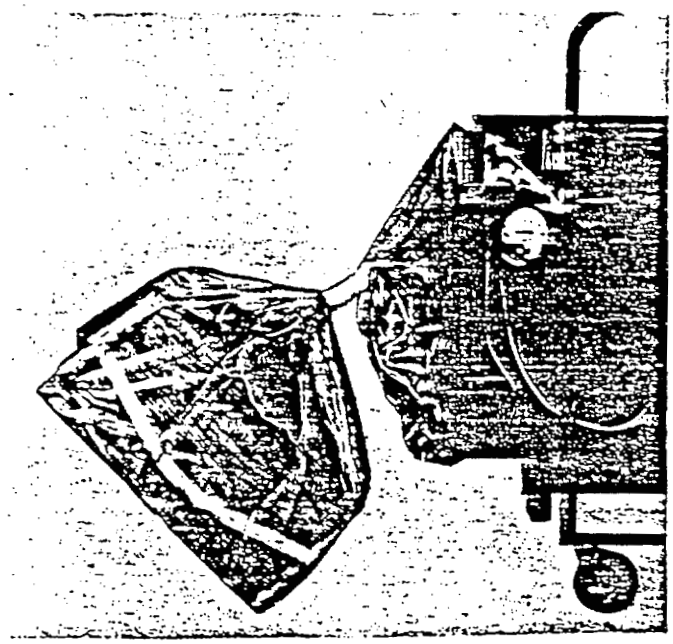


Versatile ventilation system provides from 1000 to 2500 CFM filtration in the same ultra-compact portable stainless steel unit. Air treatment options include spark arrestors, one or two prefilters, moisture eliminator and HEPA filter. Two door design of cabinet facilitates replacement of prefilters as required. E 1000 PC certified at 1000 CFM; E 2000 PC certified at 2000 CFM. Flow rates are through 24" x 24" filtration area.

- Model E 1000 PC is available with ultra-quiet 110 Volt blower motor providing 1300 CFM, or 5 H.P. blower/motor at 1600 CFM or 7.5 H.P. blower/motor with capacity to 2000 CFM. When using the Model E 1000 PC in tandem with the NPO carbon absorber carts, the 5 H.P. blower/motor is the minimum size recommended.
- Both models offer "wheelbarrow" mobility, vertical or horizontal operation removable wheels and crane lifting ring. (If moisture eliminator option is used, unit will operate only in horizontal position.)
- Model E 2000 PC unit with the same Ultra Compact Housing described above uses a 10 H.P. blower motor with capacity to over 2500 CFM. It can be safely throttled down to 300 CFM without damage to motor. It is built for use with NPO's Carbon Absorber Cart.

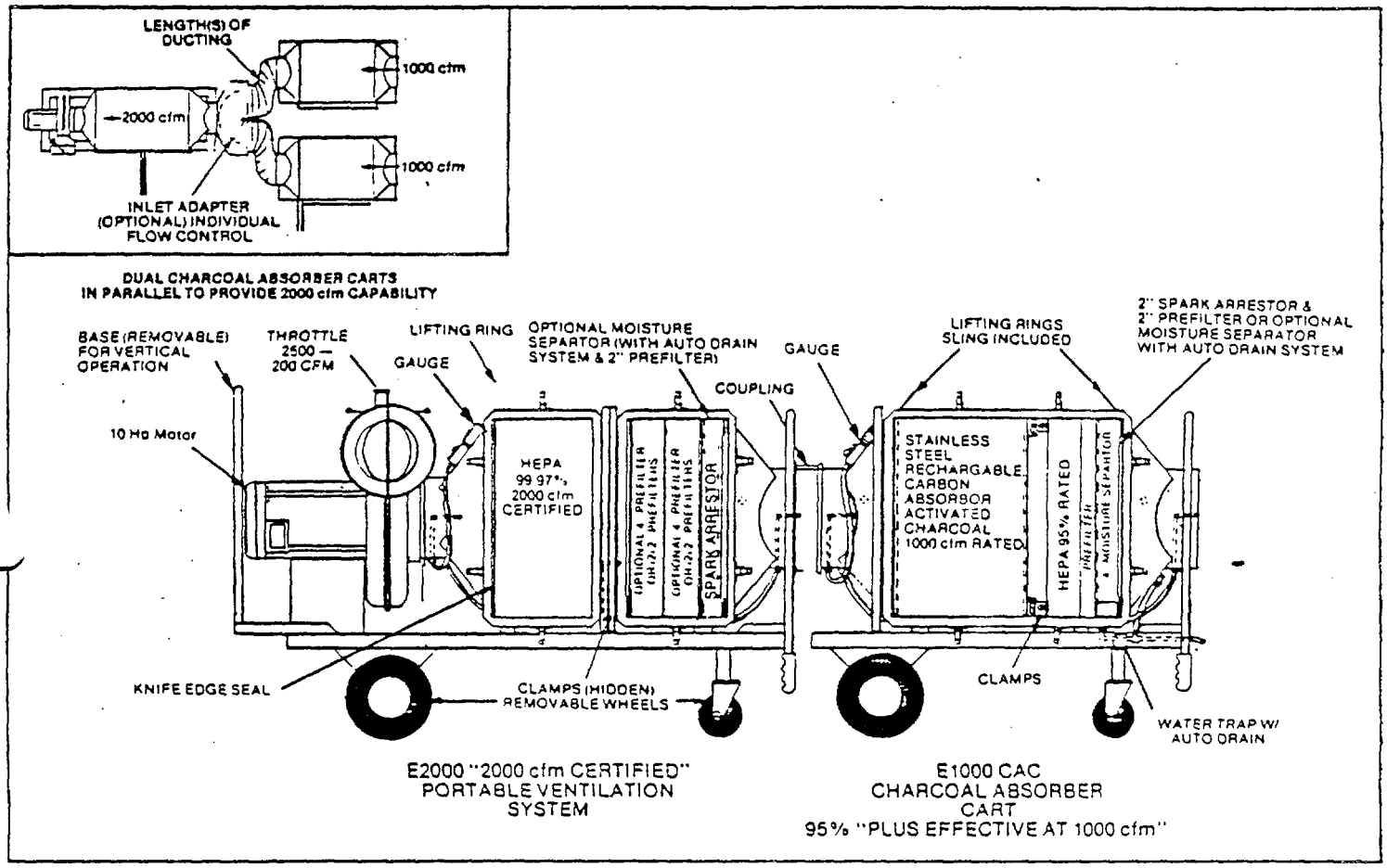


Gauge measures pressure differential across pre-filter

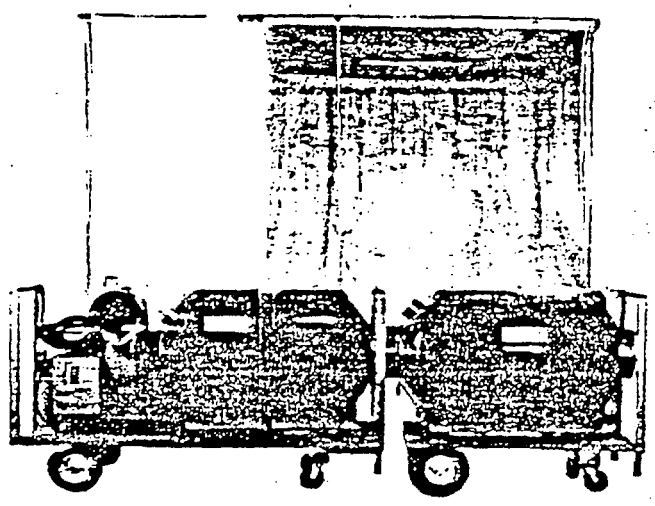


"Bag-Out" capability — Remove contaminated filters safely in poly bags. Stainless steel housing eliminates the concern for contamination buildup.

Ventilation Systems with Carbon Absorber



Vent System with Carbon Absorption Module in Tandem



Model E 1000 CAC or E 2000 CAC provides 1000 CFM or 2000 CFM filtration through rechargeable carbon absorbers. Cart connects directly or through length of duct to NPO's "certified" ventilation systems. However, it may be easily disconnected to eliminate unnecessary use when only particulate contaminants are present. Separation also provides complete portability.

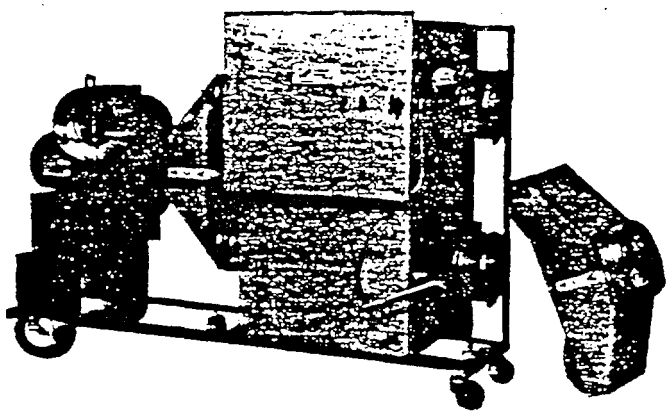
A nuclear grade carbon absorber unit contains 90 lbs. of activated charcoal in its own stainless steel housing. Effective for approximately 96% of methyl oxides and 99.99% of elemental iodides at 1000 CFM.

Complete E 1000 Carbon Absorber Cart includes spark arrestor housed in stainless steel cabinet with full bagout capability, pre-filter, 95% HEPA and carbon absorber. Optional moisture eliminator with automatic drain system may be substituted for spark arrestor.

Model E 2000 Carbon Absorber Cart includes the same components and optional moisture eliminator except two carbon absorbers are provided instead of one. The effective absorption as stated above, applies for 2000 CFM flow rates or "complete" absorption at 1000 CFM.

E 2000 PT — 2000 "Plus" CFM PORTABLE VENTILATION UNIT 8' LONG

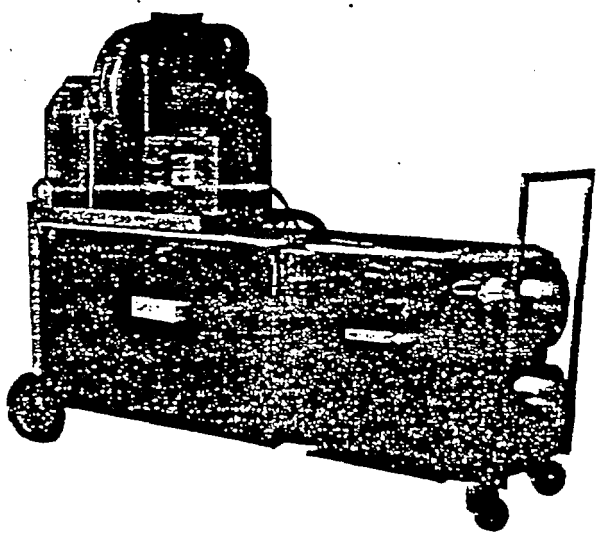
This system provides ventilation capacity from 2000 CFM to 4000 CFM. Air treatment options include sets of spark arrestors, pre-filters, moisture eliminators with drain systems, and absolute/Hepa filters.



- Blower/motor capacities to approximately 4500 CFM with throttle-control down to 500 CFM without damage to motor.
- Flow rates to 4000 CFM through filtration area of 24" x 48".
- Filter tested for 3000 CFM and "certified" for 2000 CFM. Option — filters certified for 4000 CFM and 4000 CFM blower/motor.
- Gauge measures pressure differential across pre-filter section or HEPA only all filters or inlet ducting only.
- Bag-out capability; two door cabinet facilitates replacement of pre-filters.
- Multiple inlet ports with flow adjustment.
- May be used in tandem with E 1000 CAC, or 2000 CAC carbon absorber carts.

E 1000 VQ — Ventilation System with Carbon Absorbers

Compact stainless steel housing with filtration options including spark arrestor or moisture eliminator, pre-filters 90 lb. carbon absorber, 99.9% HEPA filter and 2000 CFM blower with flow control adjustment throttle. Inlet adaptor for dual-single inlet — two door cabinet facilitates replacement of pre-filters.



- Flow rates to 2000 CFM through filtration area of 24" x 24".
- Filters usable at 2000 CFM (not recommended for extended use at this flow rate), tested to 1500 CFM and "certified" at 1000 CFM. Option — HEPA filter "certified" for 2000 CFM.
- Blower/motor capacities to approximately 2500 CFM with throttle control down to 200 CFM.
- Bag-out capability assures containment of contamination collected in filters.

For detailed specifications and/or quotations on any of NPO's Portable Ventilation/Filter Systems phone or write NPO, ALARA Engineering Group.

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Call toll free..... 800/435-8340

DRAFT

West Valley Project Office
Idaho Operations Office
P.O. Box 191
West Valley, NY 14171

September 30, 1987

Mr. Paul Giardina
U. S. Environmental Protection Agency
Region II
Air and Waste Management Division
Mail Stop 2AWM
26 Federal Plaza
New York, New York 10278

SUBJECT: Submittal of Generic Application Material for Outdoor Portable Ventilation Units (OPVU's)

Dear Sir:

Enclosed for your review is the NESHAPS application material for the generic permitting of the Outdoor Portable Ventilation Units (OPVU's) utilized at the West Valley Demonstration Project. The information provided is intended to serve as a general description of the various types of OPVU's used at the site and should not be tied to specific units or equipment.

It is our understanding that only Portable Ventilation Units used outside the main plant building will be covered under this generic permit. It is also our understanding that this office will be required to report discharges from these units in the annual emission report which will be transmitted to your office.

Your efforts to expedite the issuance of the generic permit for our OPVU's is appreciated. If you have any questions regarding this package, please contact T. Adams on FTS 473-4387.

Sincerely,

W. W. Bixby, Director
West Valley Project Office

Enclosure

cc: J. P. Hamric, DOE-ID
J. H. Barry, DOE-ID
J. L. Knabenschuh, WVNS

TGA:227:87 - 0025:87:01 - tl

R. R. Bowhan T. F. Gesell G. C. Bowman C. E. Clark pink copy

ATTACHMENT I

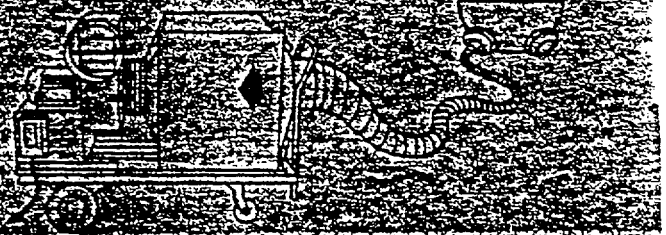
GENERAL SPECIFICATIONS APPLICABLE

TO ALL PORTABLE VENTILATION UNITS

The 1000 "PLUS"

PORTABLE VENTILATION/FILTER SYSTEMS

- CFM range from 500 to 2000 plus
- Truly portable in design
- Light weight and compact
- All air treatment solutions available
- Meets latest technical specifications

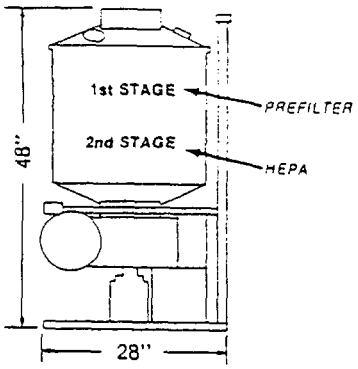


ALARA ENGINEERING GROUP

NUCLEAR POWER OUTFITTERS

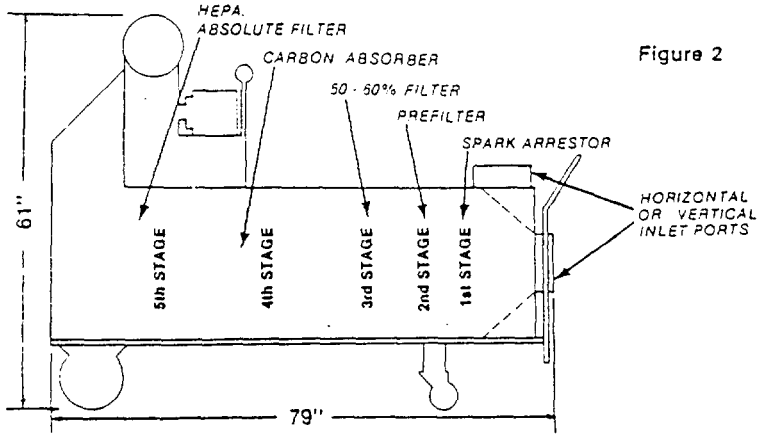
DIVISION OF HEDRON ENTERPRISES

Figure 1



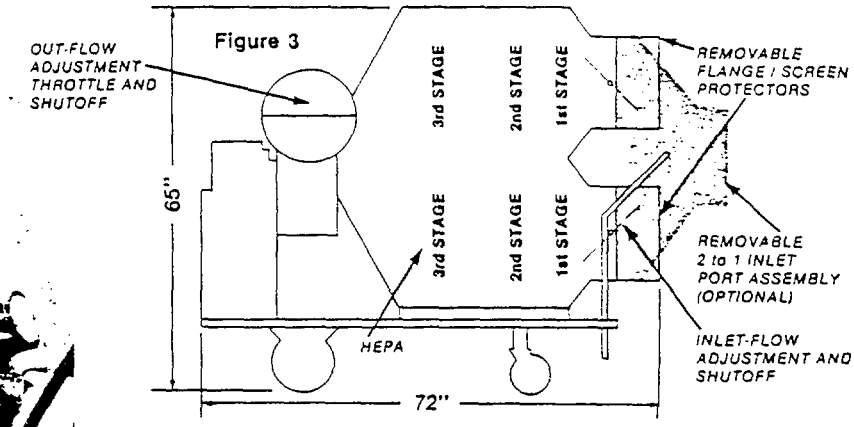
E 1000 PC, Ultra-Compact Portable Ventilation Unit. (Standing vertically with carriage removed.)

Figure 2

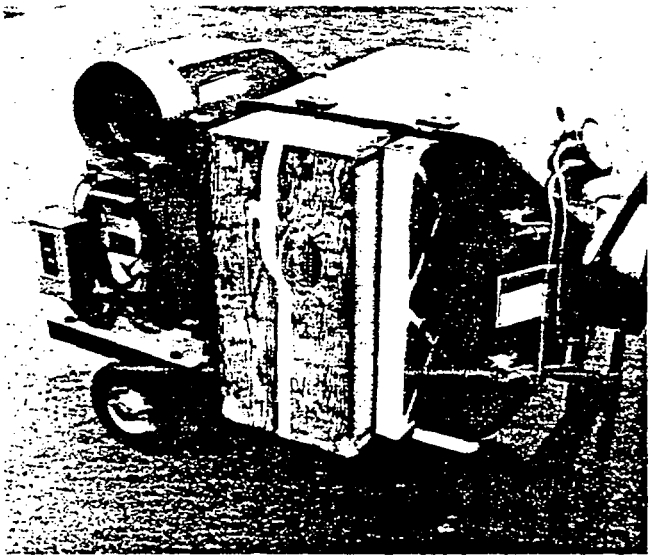


E 1000 (VQ), Multi-Housing Ventilation Systems with carbon absorbers.

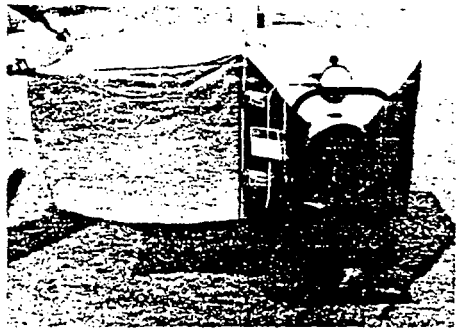
Figure 3



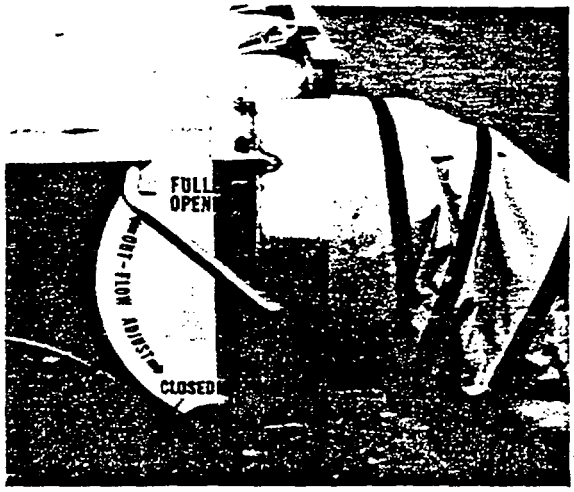
E 2000 PT, 2000 "Plus" CFM Portable Ventilation System.



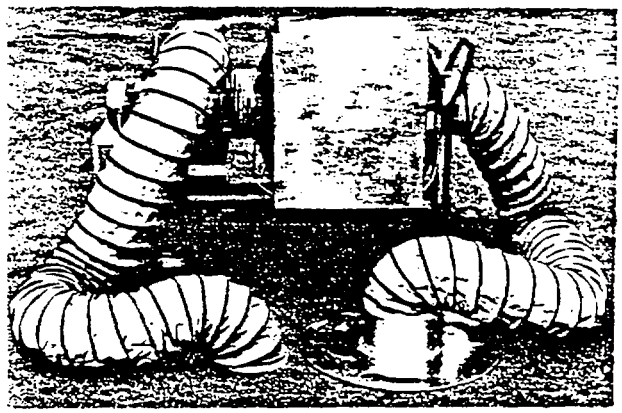
E 1000 PC Model with 2 filter stages, 99.97% HEPA and Prefilter.



Bag-out availability and stainless steel housings standard with all units.



Outflow (and inlet) Adjustment Throttle as recommended by ANSI / ASME. Reduce or shutoff air-



Accessories, including flexible ducting, steam generator port flanges and many more. (See listing on back page.)

The Recommendable Unit

NPO's 1000 "Plus" CFM *Portable* Ventilation / Filter System using the (P) Housing and (A) or (B) Blower (see back page for ordering information).

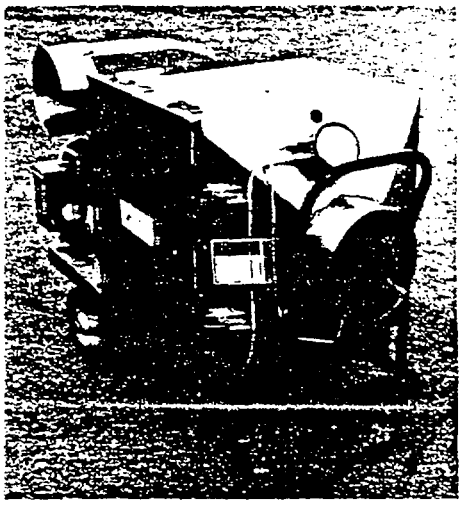
- Filter Trains up to 3 stages: Prefilter, spark arrestor, moisture separator and/or 50-60% filter with the HEPA.
- 2 or 3 HP Motor/Blower with 1500-2500 CFM free-air. Up to 7" wg. static pressure at 1000 CFM., and 10" wg. with 750 CFM (Blower/Motor (A)). See Blower/Motor Chart.
- Weighs approx. 300 lbs. with balanced cart for easy portability.
- Compact for access to almost every area. Overall dimensions 28" x 40" x 63". Can be mounted vertically. Easily removed from mobile cart for permanent or low profile installations. (28" x 28"x 63")
- Outflow Adjustment Throttle as recommended by ANSI / ASME to control flow and/or static pressure across filter train. Heavy duty motor will not be harmed by low air-flow conditions. Designation (T) in Model No.
- Hinged Access Door with bag-out feature standard (Bag-out not required for unit to operate). Prefilter access door on top optional—see drawing, Model E 1000 P. Top door designated as (D) in Model No.
- Viewing Glass Window and Light for accessing status of prefilter. (Optional) Designation (W) and/or (L) respectively in Model No.
- Static Pressure Gage with read-out switching for each filter stage.
- Facilities for filter efficiency testing (DOP).

Filter Train Selection

NPO offers all possible filtering and air treatment devices. These devices are manufactured and tested to meet the standards of the nuclear industry. (See back page for ordering information).

- HEPA 99.97% efficiency (absolute) filter. 24" x 24" x 11½" with neoprene or liquid seal.
- Carbon Absorbers. 24" x 24" x 16" or 24" x 24" x 29" (Two units in series provides greater "transient times" for more effective absorbtion).
- 50-60% Filters (Typically required upstream to carbon absorbers). 24" x 24" x 5¾"
- Moisture Separators with drain mechanism 99 + % effective in removing moisture. 24" x 24" x 5½"
- Prefilters - disposable filters to take the bulk of the dust and contamination from the air. 24" x 24" x 2" (or 4")
- Spark Arrestor - washable filters to trap welding sparks and aspirated oils and grease. 24" x 24" x 2"
- Filter

Manufacturer's specification bulletins available upon request.



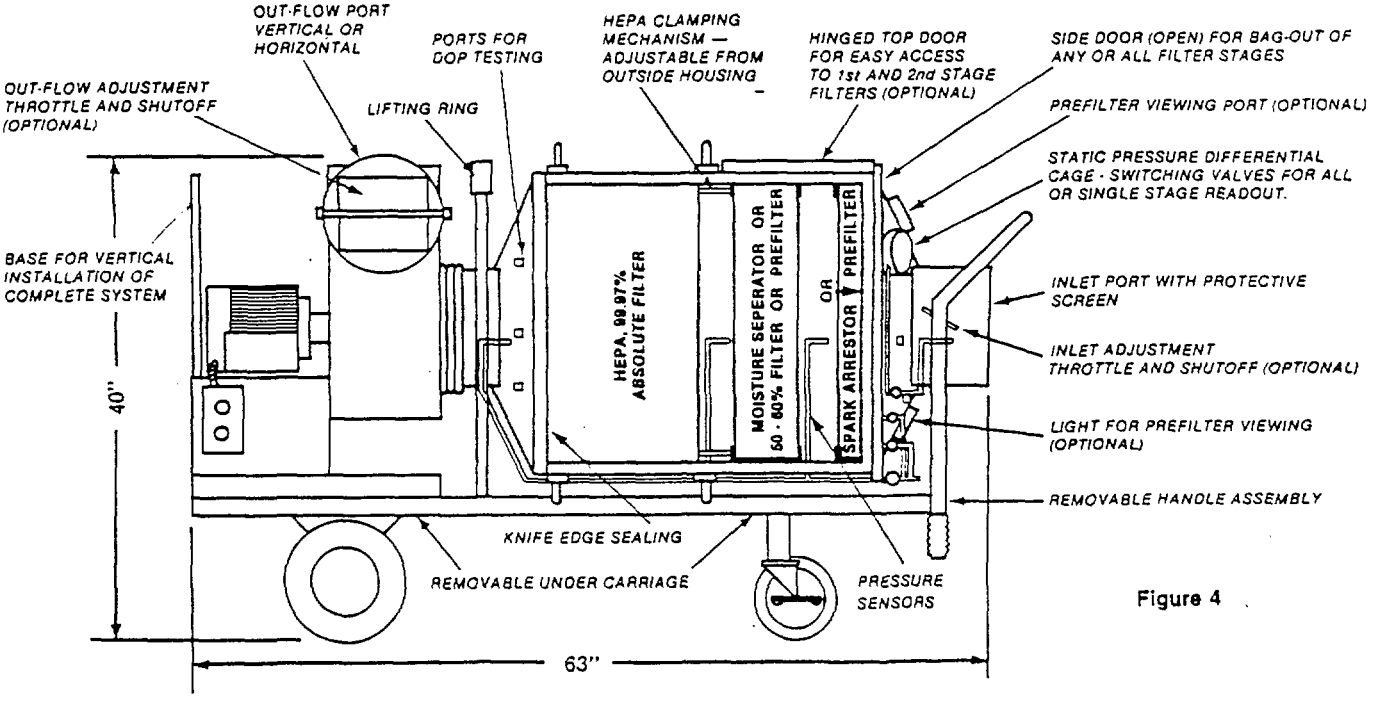


Figure 4

Portable Ventilation System — The Recommendable Unit

Adding Up the Static Pressure Losses for Blower Selection

Static Pressure Losses through Filter Stages

Prefilter	.15" Wg.*
Spark Arrestor	.15" Wg.*
60% Filter (Pre-)	.45" Wg.*
Moisture Separator	.80" Wg.*
Charcoal Absorber	1.10" Wg.*
HEPA Filter	1.00" Wg.*

*Clean filter at 1000 CFM

Note:

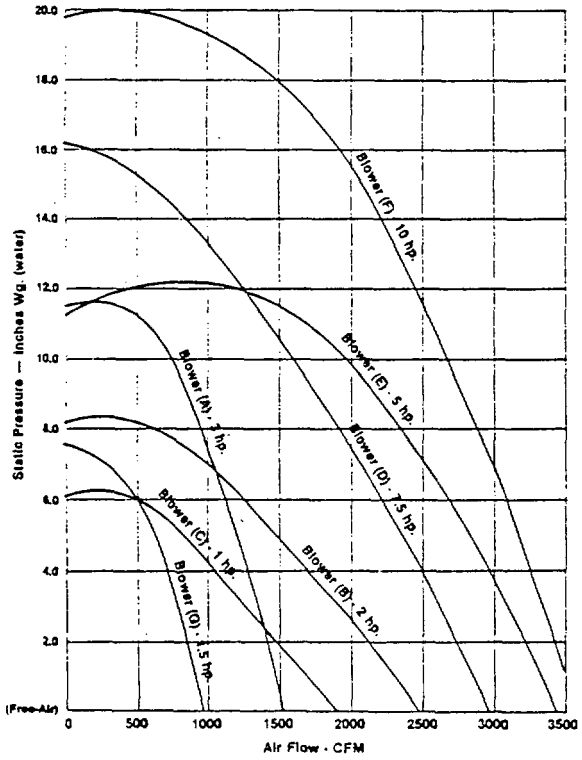
These values are approximate and can easily double if filters are dirty. The prefilter(s) can increase in static back pressure many times clean value and must be cleaned and/or replaced frequently. Internal system static pressure losses, without filters, can be up to 1" Wg.

× 2

Static Pressure Losses through Ducting (Flexible)

Duct Sizes	6"	8"	10"	12"	16"
Pressure Losses in inches of Wg. per 100 ft. of flexible ducting at:					
500 CFM	5" Wg.	.6" Wg.	.2" Wg.	.1" Wg.	<.1" Wg.
1000 CFM	14" Wg.	2.5" Wg.	.7" Wg.	.3" Wg.	.1" Wg.
2000 CFM	>20" Wg.	10 " Wg.	2.5" Wg.	1.2" Wg.	.25" Wg.

Blower Selection Air Flow vs. Static Pressure



NPO recommends blower/motor (A) for most 1000 CFM applications. (A) blower gives high flow rates even with long inlet ducts, dirty filters, and multiple stage filter trains. Yet blowers B, D, E, or F may be needed in order to provide the higher flow rates that are desired with multiple steam generator ventilation and many stage filter trains. NPO ventilation units have available an adjustable outflow device - (optional) as recommended by ANSI / ASME N509-1980 to throttle down the flow or to maintain a constant flow and/or static pressure. Inlet-flow adjust throttles are also available.

To select correct blower/motor unit, determine the total operating static pressure in inches of wg. (water). Find calculated total static pressure losses on vertical column of chart. Locate, on the horizontal line, the nominal air flow in CFM desired at the calculated total static pressure losses. The horizontal and vertical intersection of these points yields the blower/motor recommendation. Various electric motor operating voltages are available. Specify voltage, single or three phase current and explosion proof requirements when ordering.

Systems for Every Application:

- **Contamination and hazard control**
- **Clean room environments**
- **Steam generator work**
- **Containments and glove bags** (See NPO's Product Bulletin)
- **Welding fumes and collection**
- **High humidity requiring moisture removal**
- **Gas removal with charcoal absorbers AND portability**

Design Features Include:

- Regardless of the filtering or air treatment requirement, NPO / PPI has it. HEPA, moisture separators, charcoal absorbers, spark arrestors, prefilters, etc.
- Blower / Motor selection from 1 HP to 10 HP with free air to 4000 CFM and Static Pressures to 17" wg at 1000 CFM.
- Five stainless steel housing sizes from the Ultra Portable (PC) Housing with 2 or 3 stages (figure 1) to Multiple Housings with 5 or 6 stages (figure 2). 2000 CFM Systems with 2 high housings, available in any configuration (figure 3).
- Positive sealing access doors with Bag-Out feature standard with all housings (bag not required for unit to function). Unique "Tape-seal" bags make filter change-out easy yet contamination free.
- Out-flow and Inlet-flow Adjust Throttles (optional) for complete control of air-flows and/or static pressures - ANSI / ASME recommended.
- Multiple Inlet Ports and Steam Generator Flange Ports available
- Gage(s) for continuous reading of static pressure across every filter stage.
- Facilities for measuring the efficiency (DOP) of every stage in the filter train.
- *All the above features and portability too* (see back page for system selection and ordering information).

Systems Ordering Information

The 1000 "Plus" CFM Portable Ventilation Unit· "The Recommendable System" (see Figure 4)

E 1000 P( ) ( ) (see Housing Accessory Listing below)

Filter Options	Blower/Motor Options
(-1) Prefilter and HEPA only	(A-110) A Blower with
(-2) Spark Arrestor, Prefilter and HEPA	(A) 110 volt motor
(-3) Prefilter, Moisture Separator and HEPA	(B)
(-4) Prefilter, 60% Filter (Pre) and HEPA	(C) see Blower/Motor
	(E) Selection Table

Ultra-Compact Portable Ventilation Units (see Figure 1)

E 500 PC (-1) ( ) (see Housing Accessory Listing below), size 40" x 20" x 28" · 500 CFM rated*

E 1000 PC (-1) ( ) (see Housing Accessory Listing below), size 48" x 28" x 28" · 1000 CFM rated

**11" for Removable Carriage*

Filters — **Blower/Motor Options**

Includes Prefilter and HEPA only

(C), (G) → E 500

(A-100), (A), (B), (C) → E 1000

see Blower/Motor Selection Table

2000 "Plus" CFM Portable Ventilation Unit (see Figure 3)

E 2000 PT ( ) ( ) (see Housing Accessory Listing below)

Filter Options (2 sets required)	Blower/Motor Options
(-1) Prefilter and HEPA only	(D)
(-2) Spark Arrestor, Prefilter and HEPA	(E) see Blower/Motor
(-3) Prefilter, Moisture Separator and HEPA	(F) Selection Table
(-4) Prefilter, 60% Filter (Pre) and HEPA	

1000 "Plus" CFM Multi-Housing Ventilation Systems, with Carbon Absorbers (see Figure 2)

E 1000 ( ) ( ) (see Housing Accessory Listing below)

Modular Housing and Filter Train Options (maximum of 3 housings)	Blower/Motor Options
(V-1, Prefilter Housing with Prefilter and 60% Filter (Pre)	(A-100) see Blower/ (A) Motor (B) Selection (E) Table
(V-2, Prefilter Housing with Spark Arrestor, Prefilter and 60% Filter (Pre)	
(V-3, Prefilter Housing with 2 Prefilters	
Q-1, Carbon Absorber Housing with Carbon Absorber in 1st stage and HEPA in 2nd stage	
Q-2, Carbon Absorber Housing with Carbon Absorbers in both 1st and 2nd stages	
H) For HEPA Absolute Filter when Q-2 Housing is required or when both Moisture separator and 60% filter stages are required upstream from	

2000 "Plus" CFM Multi-Housing Ventilation Systems with Carbon Absorbers

E 2000 ( ) ( ) (see Housing Accessory Listing below)

Tandem (stacked) Modular Housings and Filter Train Options (maximum of 3 housing sets)	Blower/Motor Options
See 1000 "Plus" CFM Multi-Housing Ventilation Systems for details.	(D) (E) see Blower/Motor (F) Selection Table

Housing Accessories

(Letter prefixes complete systems model No. - list in same order as below).

(D, - Top Mounted Door for quick removal of prefilters (available in all P & V Housings)
T_o, - Outflow Adjustment Throttle and Shutoff
T_1, - Inlet-Flow Adjustment Throttle and Shutoff
W - Window only for viewing prefilter
L, - Lighted Prefilter (includes viewing glass and light)
I_2, - Multiple Inlet Port Adapters, (2) 10" Dia. ports
I_4, - Multiple Inlet Port Adapters, (4) 6" Dia. ports
Y) - "Y" Inlet Port Adapter for E 2000 PT, 2000 "Plus" CFM Portable Ventilation System. Couples dual inlets into a common inlet port.

Miscellaneous Accessories

E 100 SGA ( ) Steam Generator Flange Adapter - 10" Dia. Duct
E 100 SGB ( ) Steam Generator Flange Adapter - 16" Dia. Duct

Identify steam generator manufacturer or include drawing of generator opening.

E 101 DA	6" Flexible Ducting - 25 ft. lengths
E 101 DB	8" Flexible Ducting - 25 ft. lengths
E 101 DC	10" Flexible Ducting - 25 ft. lengths
E 101 DD	12" Flexible Ducting - 25 ft. lengths
E 101 DE	16" Flexible Ducting - 12 and 24 ft. lengths
E 101 DCA	Stainless Steel Canistor for 6" Dia. Ducting 25 ft. Lengths
E 101 DCB	Stainless Steel Canistor for 8" Dia. Ducting 25 ft. Lengths
E 101 DCC	Stainless Steel Canistor for 10" Dia. Ducting 25 ft. Lengths
E 101 DCD	Stainless Steel Canistor for 12" Dia. Ducting 25 ft. Lengths
E 101 DCE	Stainless Steel Canistor for 16" Dia. Ducting 24 ft. Lengths
E 102 BPCA	PVC Bag for E 500 Ultra Compact Portable Unit
E 102 BPCB	PVC Bag for E 1000 Ultra Compact Portable Unit
E 102 BP	PVC Bag for "Recommendable" Portable Unit
E 102 BV	PVC Bag for "V" Housing
E 102 BQ	PVC Bag for "Q" Housing
E 102 BH	PVC Bag for "H" Housing

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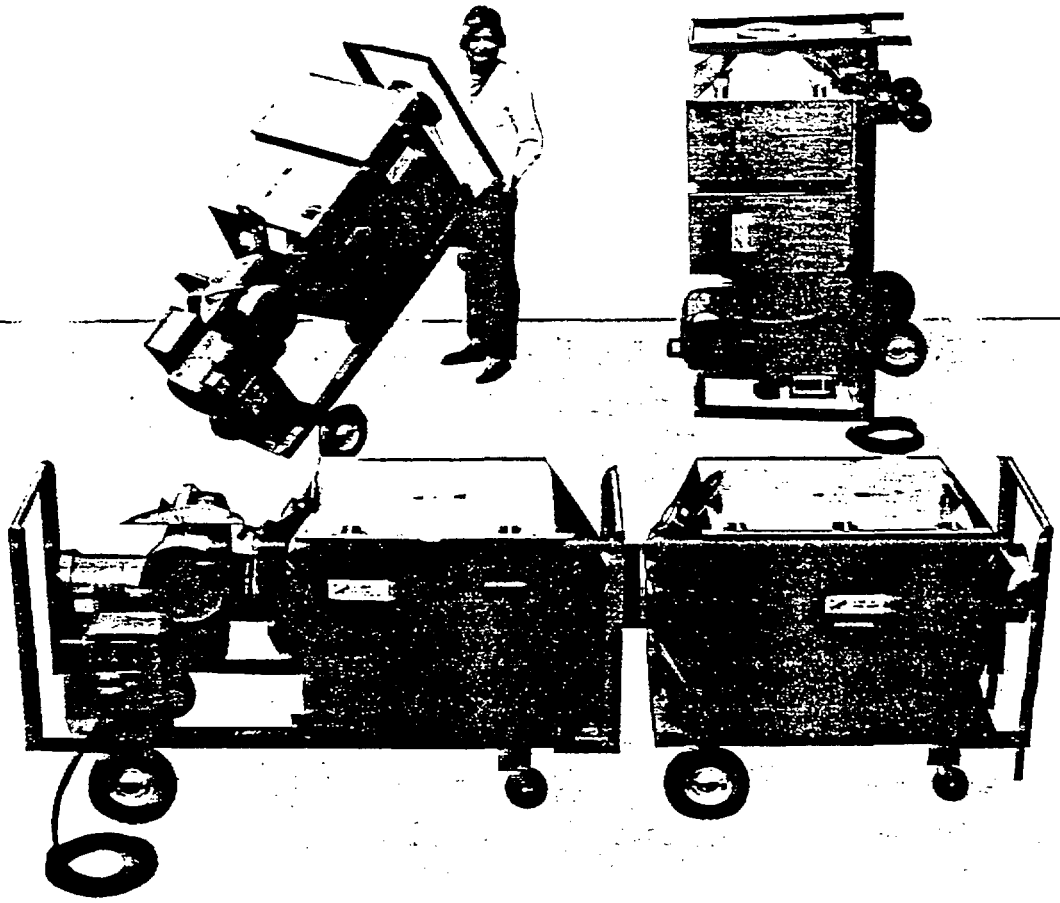
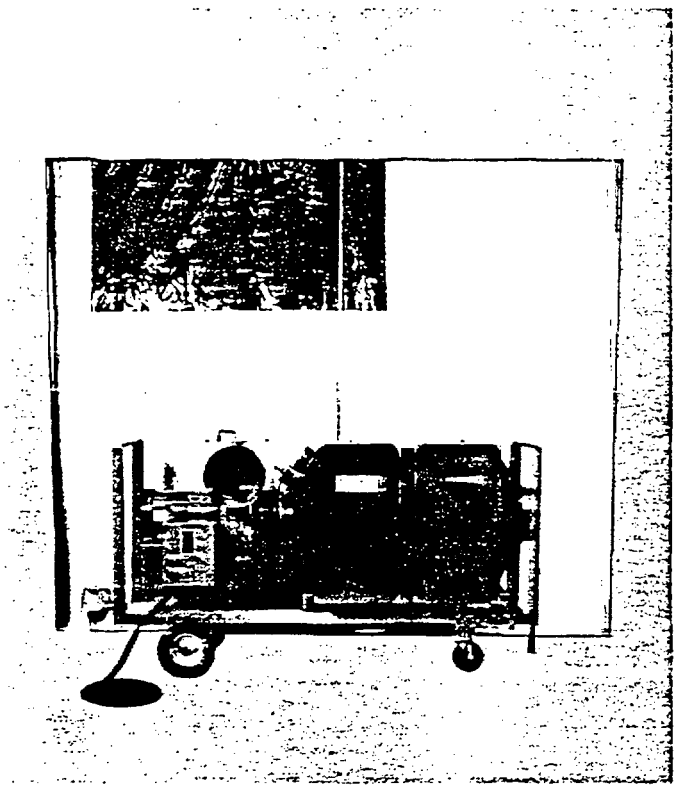


SYSTEMS FOR EVERY APPLICATION

- Particulate or gas removal
- CFM range from 500 to 4000 plus
- Truly portable in design
- Light weight and compact
- All air treatment solutions available
- Meets latest technical specifications

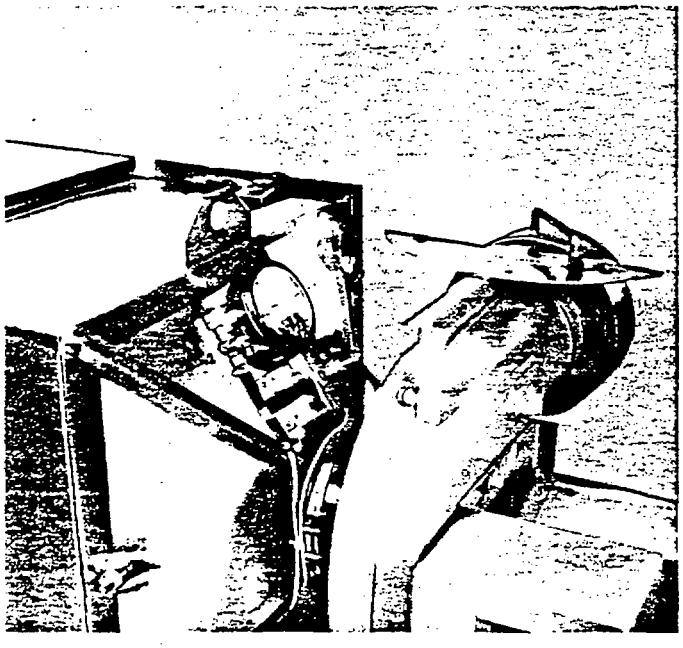
Portable Ventilation Systems

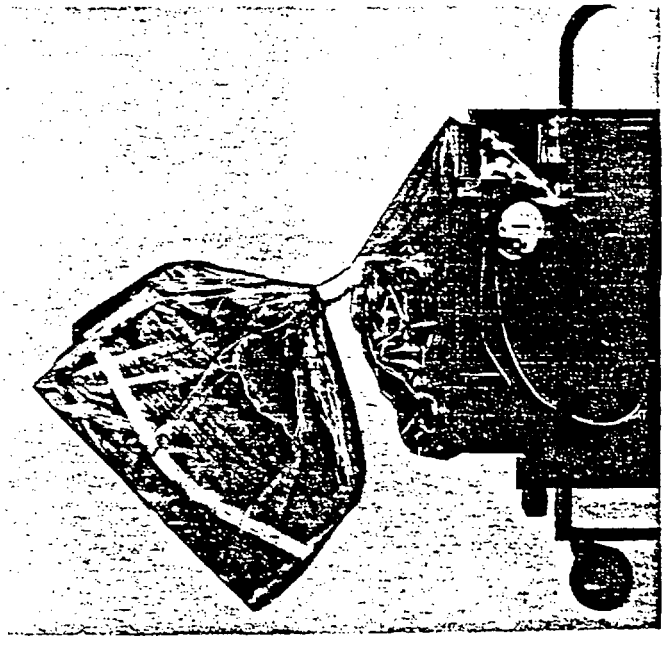
MODEL E 1000 PC, E 2000 PC — "CERTIFIED PORTABLE VENTILATION UNITS"



Versatile ventilation system provides from 1000 to 2500 CFM filtration in the same ultra-compact portable stainless steel unit. Air treatment options include spark arrestors, one or two prefilters, moisture eliminator and HEPA filter. Two door design of cabinet facilitates replacement of prefilters as required. E 1000 PC certified at 1000 CFM; E 2000 PC certified at 2000 CFM. Flow rates are through 24" x 24" filtration area.

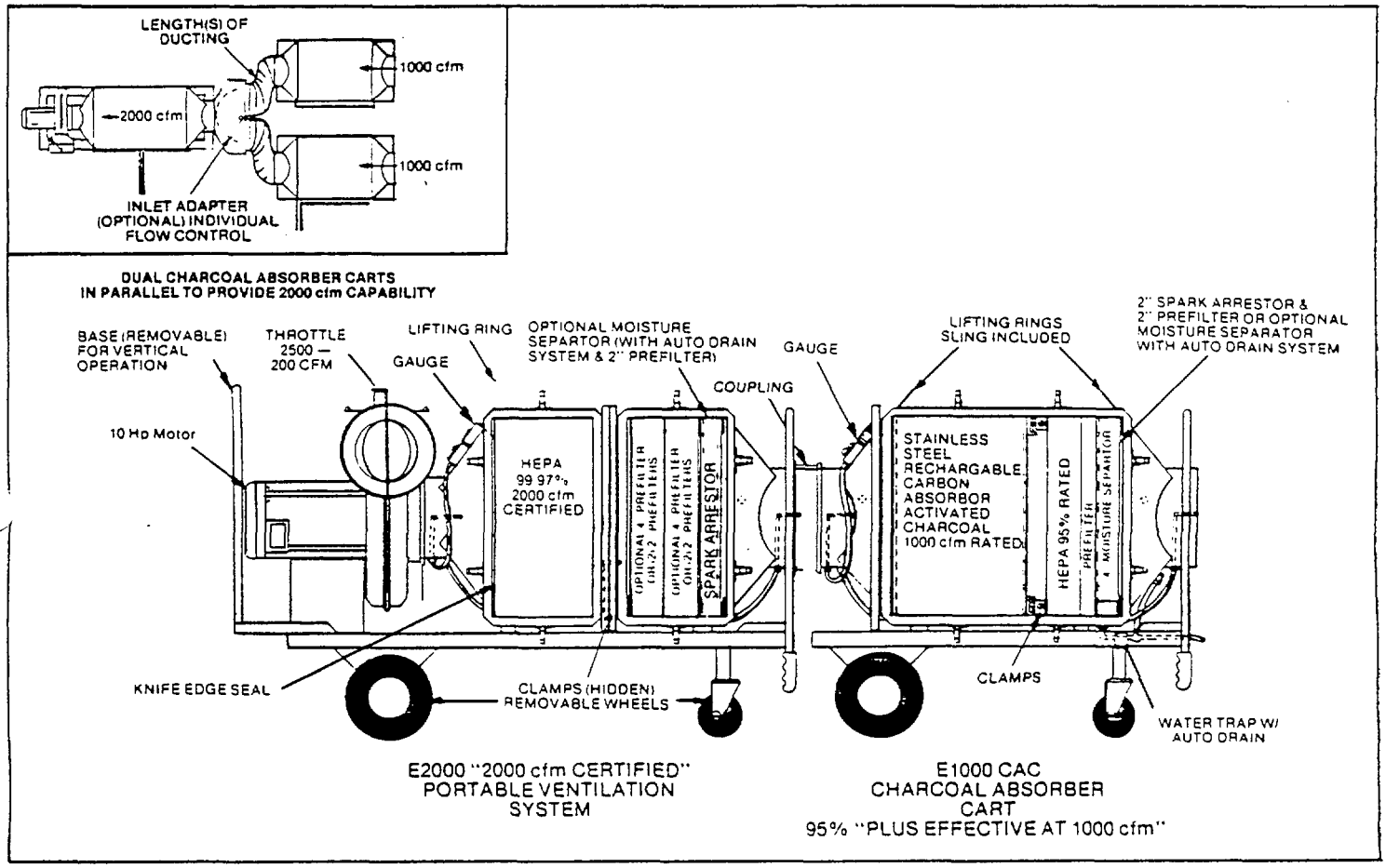
- Model E 1000 PC is available with ultra-quiet 110 Volt blower motor providing 1300 CFM, or 5 H.P. blower/motor at 1600 CFM or 7.5 H.P. blower/motor with capacity to 2000 CFM. When using the Model E 1000 PC in tandem with the NPO carbon absorber carts, the 5 H.P. blower/motor is the minimum size recommended.
- Both models offer "wheelbarrow" mobility, vertical or horizontal operation removable wheels and crane lifting ring. (If moisture eliminator option is used, unit will operate only in horizontal position.)
- Model E 2000 PC unit with the same Ultra Compact Housing described above uses a 10 H.P. blower motor with capacity to over 2500 CFM. It can be safely throttled down to 300 CFM without damage to motor. It is built for use with NPO's Carbon Absorber Cart.



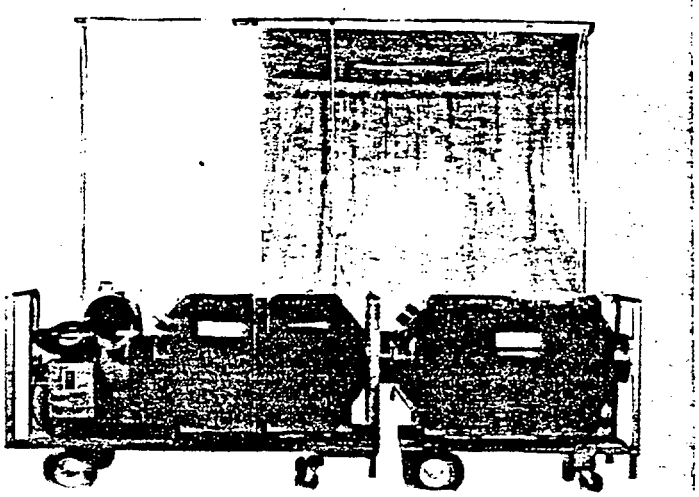


"Bag-Out" capability — Remove contaminated filters safely

Ventilation Systems with Carbon Absorber



Vent System with Carbon Absorption Module in Tandem



Model E 1000 CAC or E 2000 CAC provides 1000 CFM or 2000 CFM filtration through rechargeable carbon absorbers. Cart connects directly or through length of duct to NPO's "certified" ventilation systems. However, it may be easily disconnected to eliminate unnecessary use when only particulate contaminants are present. Separation also provides complete portability.

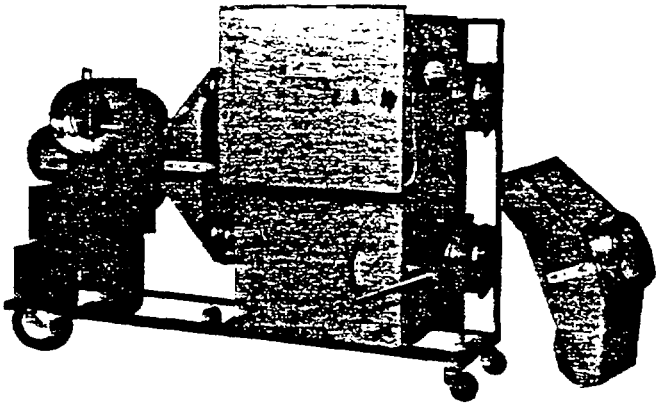
A nuclear grade carbon absorber unit contains 90 lbs. of activated charcoal in its own stainless steel housing. Effective for approximately 96% of methyl oxides and 99.99% of elemental iodides at 1000 CFM.

Complete E 1000 Carbon Absorber Cart includes spark arrestor housed in stainless steel cabinet with full bagout capability, pre-filter, 95% HEPA and carbon absorber. Optional moisture eliminator with automatic drain system may be substituted for spark arrestor.

Model E 2000 Carbon Absorber Cart includes the same components and optional moisture eliminator except two carbon absorbers are provided instead of one. The effective

E 2000 PT — 2000 "Plus" CFM PORTABLE VENTILATION UNIT 8' LONG

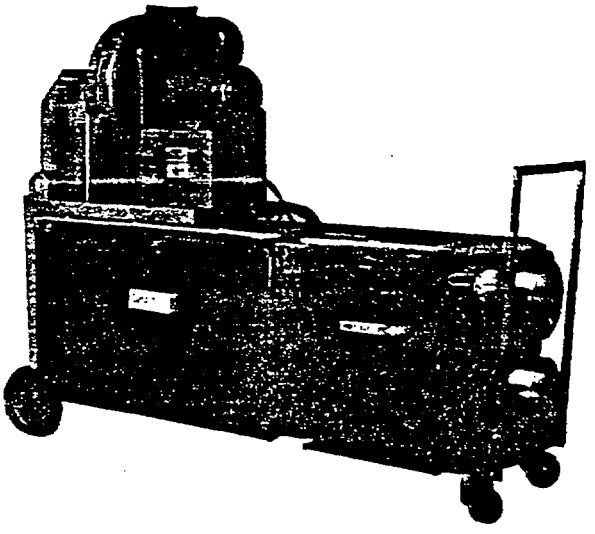
This system provides ventilation capacity from 2000 CFM to 4000 CFM. Air treatment options include sets of spark arrestors, pre-filters, moisture eliminators with drain systems, and absolute/Hepa filters.



- Blower/motor capacities to approximately 4500 CFM with throttle-control down to 500 CFM without damage to motor.
- Flow rates to 4000 CFM through filtration area of 24" x 48".
- Filter tested for 3000 CFM and "certified" for 2000 CFM. Option — filters certified for 4000 CFM and 4000 CFM blower/motor.
- Gauge measures pressure differential across pre-filter section or HEPA only all filters or inlet ducting only.
- Bag-out capability; two door cabinet facilitates replacement of pre-filters.
- Multiple inlet ports with flow adjustment.
- May be used in tandem with E 1000 CAC, or 2000 CAC carbon absorber carts.

E 1000 VQ — Ventilation System with Carbon Absorbers

Compact stainless steel housing with filtration options including spark arrestor or moisture eliminator, pre-filters 90 lb. carbon absorber, 99.9% HEPA filter and 2000 CFM blower with flow control adjustment throttle. Inlet adaptor for dual-single inlet — two door cabinet facilitates replacement of pre-filters.



- Flow rates to 2000 CFM through filtration area of 24" x 24".
- Filters usable at 2000 CFM (not recommended for extended use at this flow rate), tested to 1500 CFM and "certified" at 1000 CFM. Option — HEPA filter "certified" for 2000 CFM.
- Blower/motor capacities to approximately 2500 CFM with throttle control down to 200 CFM.
- Bag-out capability assures containment of contamination collected in filters.

For detailed specifications and/or quotations on any of NPO's Portable Ventilation/Filter Systems phone or write NPO, ALARA Engineering Group.

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ATTACHMENT II

DESCRIPTION OF PORTABLE VENTILATION

UNITS AND FILTER UNITS

GENERAL DESCRIPTION

The E1000 and E2000 Series Ventilation/Filtration Systems are designed to adapt to hazardous environmental uses with compactness and portability.

The housing and blower/motor are mounted to a steel frame with removable wheels and handles. The steel frame is painted with an acid resistant epoxy paint. With the back handle mounted to the frame, the unit can be operated in the vertial position.

A high performance blower and motor are mounted towards the back of the unit, which includes a starter and 25' of power cord. The blower has an outflow throttle (standard) for a full range of air flows without harming the blower/motor.

A differential pressure gauge (magnehelic) is mounted towards the blower/motor. The gauge is used for measuring pressure losses across filter stages.

The filtration housing is constructed from 304 stainless steel. On some units, DOP testing ports are mounted on the front and back transistions. On the same side as the DOP ports and in the center of the housing there are two 3/4" holes with rubber plugs. These two holes are access holes for the HEPA clamping mechanism. On the opposite side of the clamp holes there are two filter doors. Both doors have a knife edge seal and bag-out capability. The compartment towards the air inlet is the rouging filter section. The compartmet towards the blower is the HEPA filter section.

FILTER OPTIONS AND DESCRIPTION

The E1000 and E2000 utilize three different filter configurations:

1. Pre-filter and HEPA only;
2. Spark arrestor, pre-filter, and HEPA;
3. (E1000 only) Moisture separator, prefilter, and HEPA.

Pre-filters, or roughing filters, are located upstream to collect the bulk of the particulates, which will extend the life of the more expensive HEPA filter. The pre-filters used are 2" or 4" wide with a filtering efficiency of 30 percent. The pleated type filter contains up to 7 times greater filtering area compared to non-pleated glass fiber or synthetic media filters. NPO employs a medium efficiency, totally disposalbe, pleated cotton fabric pre-filter.

The spark arrestor is only used in the first stage, to trap aspirated oils and grease and to protect the next stages from sparks in a welding ventilation situation. A spark arrestor requires a pre-filter down stream from it to protect the HEPA

The moisture separator is used in the first stage for the removal of fog, mist, rain droplets, and steam. The moisture separator has a 98 percent efficiency on 20 micron diameter droplets. The moisture separator filter can only be used with NPO's 1000 CFM ventilation units which contain the filter pan and drain assembly. The drain assembly is designed to allow water to drain under a negative pressure. The moisture separator requires a pre-filter downstream. (Note: A 1000 CFM ventilator with a moisture separator cannot be operated in the vertical position.)

The HEPA (High Efficiency Particulate Air) filters are used to remove small particulates; they have an efficiency of 99.97 percent on 0.3 micrometers. HEPA filters consist of an external rigid casing with folded paper type media attached by special adhesives. Gaskets used to seal the filter to the ventilator are closed cell neoprene type.

FANS (BASIC FAN LAWS AND AIR CHANGE METODS)

A portable ventilation fan must have flow characteristics that allow it to operate over a large static pressure range. It must be able to handle its own system losses plus the increased pressure drops as filters collect dirt or when flexible duct is added.

NPO employs direct drive fans for a more compact design and service reliability. The fans are also located down stream of all the filters to maintain negative pressure in the filtration housing and to keep the fan clean from contamination.

BASIC FAN LAWS

Fan efficiencies remain constant for symmetrical design. If one or more conditions change, the other conditions also change according to certain fan laws for an established fan size, air density, and system of ductwork.

When fan speed is changed:

1. Fan's air delivery will vary directly as the RPM ratio

$$CFM2 = \frac{RPM2}{RPM1} (CFM1)$$

2. Developed fan pressures will vary as the RPM ratio is squared:

$$SP2 = \frac{RPM2}{RPM1} (SP1)$$

3. Horsepower absorbed by a fan will vary as the RPM ratio is cubed:

$$HP2 = \frac{RPM2}{RPM1} \text{ (HP1)}$$

When fan pressure varies:

1. Fan's air delivery and RPM will vary as the square root of the pressure ratio.

2. Horsepower absorbed by fan will vary as the square root of the pressure ratio cubed.

When density of air varies:

1. For constant pressure - fan speed air delivery and horsepower absorbed vary inversely as the square root of the density.

2. For constant air delivery and fan speed - horsepower absorbed by fan and pressure developed vary directly as the air density.

3. For constant amount of air by weight - air delivery, fan speed, and developed pressure vary inversely as the density ratio.

4. For constant amount of air by weight - horsepower absorbed by fan varies inversely as the square of the density ratio.

AIR CHANGE METHOD

The first point to think about when choosing the capacity and size of the ventilator or fan necessary is to determine the total cubic feet of air space of the building to be ventilated. Also, the necessary number of air changes required to give the correct ventilation needs to be found.

$$CFM = \frac{\text{Building Volume (Cubic Feet)}}{\text{Minute/Air Change}}$$

EXAMPLE:

A building that is 100' long, 40' wide, and 15' tall - multiply 100' by 40' by 15', giving you 60,000 cubic feet of air space. Assume a 3 minute air change is necessary, 60,000 cubic feet of air space divided by 3 gives you 20,000 CFM needed to change the air every 3 minutes (20 air changes an hour).

The air changes needs to have to be determined. The selection of a fan or ventilator depends on the conditions that exist from the viewpoint of the installation and coverage necessary to dispose of all the dead air space posible. It is advisable to install the fan on the side of the building opposite from the prevalent wind in order to secure the maximum efficiency from the fan. Also, the fan should be located opposite the intake so as to fully utilize the air movement over the complete area. Ventilators should also be installed on the roof to provide a complete sweep of air movement of the area which is to be ventilated.

INTAKE AIR

Adequate intake should be provided to sufficiently ventilate the area with not too high of an intake of air velocity. There isn't any set rule for intake velocity, but as a suggestion use a maximum of 300 to 500 FPM. Each installation may vary because of the existing conditions. Doors and windows can be used as intake if they are positioned close enough to the floor line or located to give a thorough sweep of the area to be ventilated.

$$\text{Square Feet Free Intake Area} = \frac{\text{CFM}}{\text{FPM}}$$

EXAMPLE:

In reference to the example just provided, we require 20,000 CFM divided by 300 FPM (assume) will provide approximately 67 square feet of the free intake needed. Figure the amount of free area that exists through windows and doors. If it's not enough, adjustable or fixed louvers can be put in to make up the difference. Another point to take into consideration is the actual installation in regard to winter conditions. It may be desirable to install adjustable louvers that will enable the adjustment of blades and govern the amount of air intake by using one or two of the ventilators or exhaust fans (a part of the total ventilators). Windows can also be utilized, if needed, by employing the same principle - whichever is the most suitable for the job.

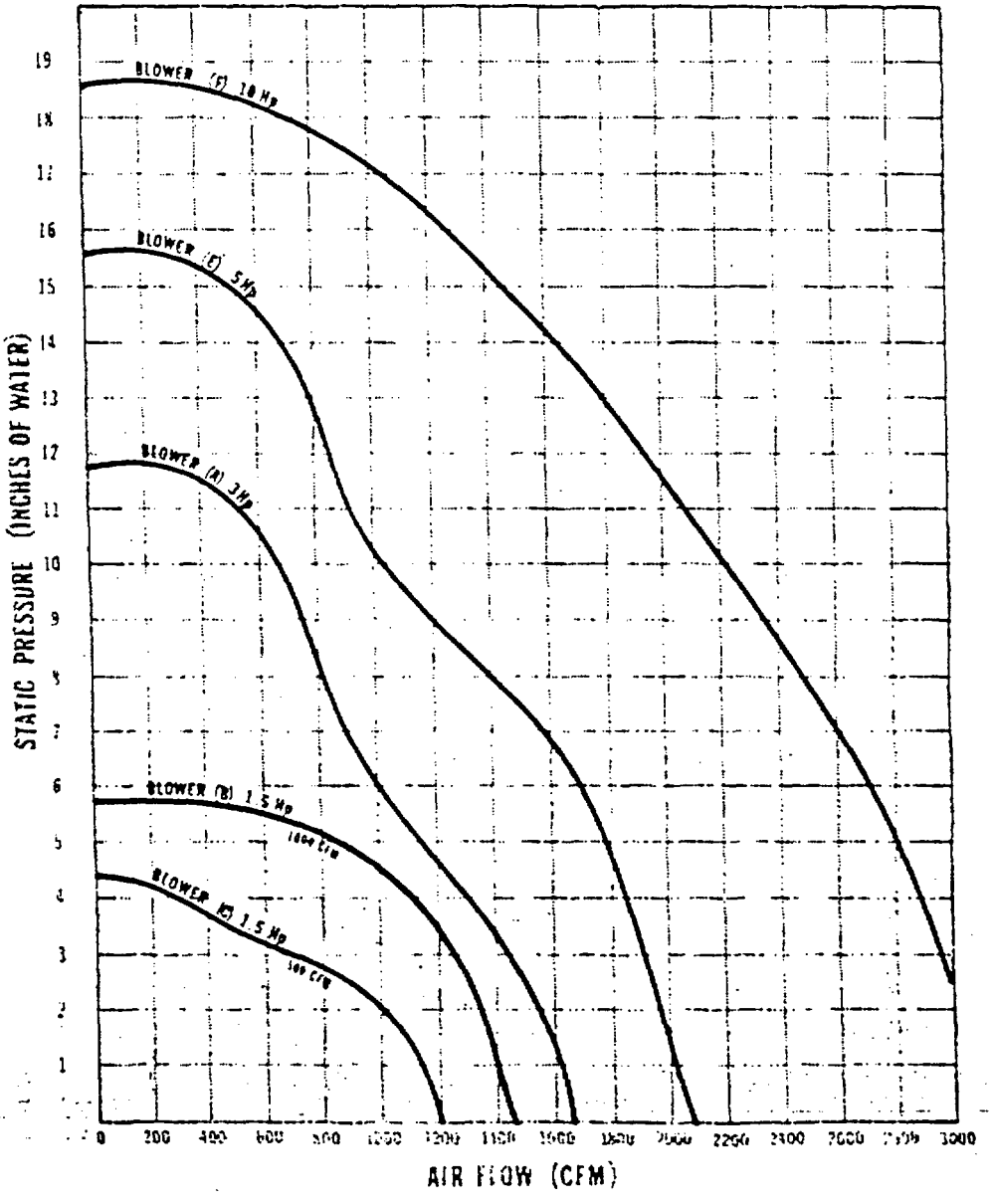
MOTORS

For most 1000 CFM applications, the 3 hp motor with blower (A) is recommended; it has a large static pressure range to adjust for dirty filters or flexible duct. If high amperage draws of a single phase or no three phase connections, NPO manufactures a 1000 CFM ventilator that requires only a single phase circuit. It is a 1 1/2 hp motor and blower (B), a specially designed fan for quietness.

If your future growth would require a charcoal cart for iodide removal, NPO recommends a 5 hp motor and blower (E) to allow for the added pressure losses due to extra filters and cabinets.

A 10 hp motor with blower (F) makes up the standard 2000 CFM ventilator cart. A 7 1/2 hp motor with blower (D) and a 15 hp motor with blower (B) (not shown on graph) are also available for other 2000 CFM applications.

Our 500 CFM potable ventilator incorporates the blower inside the cabinet for compactness. The fan is designed to run quiety with its 1 1/2 hp, 15 amp, 115 volt motor.



Blower motor curves of this unit are highlighted.

Capacitor Start Induction Run Motors - These motors are designed to be used in cases where the single phase HP requirements are 1/4 HP or more. These motors are also available in either totally enclosed or open construction and use a capacitor in the starting winding with a centrifugal switch that cuts in the running winding when the appropriate speed is reached. All of these motors are wound for 115/230 dual voltage.

THREE PHASE MOTORS

Most three phase motors are of the squirrel cage type. It is the most usual type of three phase motor, and it consists of internal coils which are connected and grouped so as to structure definite polar areas and produce a revolving magnetic field. These are obtainable in totally enclosed or open type, and they are used as standard on all models in the NPO product line. All are wound for dual voltage, 200-208-230/460, or single voltage, 575 volts, whatever is deemed necessary by the conditions of the job. When operating bigger motors for centrifugal fans and ventilators, it is desirable to use high slip motors. This will give the unit a slower and smoother start.

EXPLOSION PROOF MOTORS

Single Phase - All explosion proof motors used on NPO's single phase units are either of the Split Phase or Capacitor Start Induction Run design. These motors are furnished with an internal over-temperature circuit-interrupting apparatus. If this apparatus should trip, it would automatically reset after the motor cooled. If automatic restarting might create a hazard, a motor with a manual reset apparatus should be used.

Third Phase - All three phase explosion proof motors are of the squirrel cage form and are fabricated as described above.

MOTOR FULL LOAD CURRENTS

3 PHASE A.C. INDUCTION TYPE - SQUIRREL CAGE AND WOUND ROTOR

HP	200V	230V	460V	575V
1/2	2.3	2	1	.8
3/4	3.2	2.8	1.4	1.1
1	4.15	3.6	1.8	1.4
1 1/2	6	5.2	2.6	2.1
2	7.8	6.8	3.4	2.7
3	11	9.6	4.8	3.9
5	17.5	15.2	7.6	6.1
7 1/2	25	22	11	9
10	32	28	14	11
15	48	42	21	17
20	62	54	27	22
25	78	68	34	27
30	92	80	40	32
40	120	104	52	41
50	150	130	65	52
60	177	154	77	62
75	221	192	96	77
100	285	248	124	99
125	358	312	156	125
150	415	360	180	144
200	550	480	240	192

SINGLE PHASE

HP	115V	230V
1/6	4.4	2.2
1/4	5.8	2.9
1/3	7.2	3.6
1/2	9.8	4.9
3/4	13.8	6.9
1	16	8
1 1/2	20	10
2	24	12
3	34	17
5	56	28
7 1/2	80	40
10	100	50

HAZARDOUS LOCATIONS

Explosion proof motors are designed for general use or fan duty in the following hazardous areas: Class I, Group D, and Class II, Groups E, F, and G. All motors are labeled and listed by the Underwriters' Laboratories Inc., for use in the locations specified.

1. Class 1 Locations - As defined by Par. No. 5004 of the National Electrical Code, Class 1 Locations are those where inflammable vapors or gases may exist in the air in quantities large enough to create ignitable or explosive combinations. Class 1 atmospheres are divided into four categories due to the difference in the characteristics of gases. Explosion proof motors should be employed only to the category for which they are listed.

   Class 1, Group A: Atmospheres containing acetylene.
   Class 1, Group B: Atmospheres containing hydrogen vapors or gases of equal hazard such as manufactured gas.
   Class 1, Group C: Atmospheres containing ethyl-ether vapor, cyclopropane, or ethylene.
   Class 1, Group D: Atmospheres containing gasoline, benzine, butane, hexane, propane, naptha, benzol, actone, alcohol, lacquer solvent vapors, or natural gas.

2. Class 2 Locations - Class 2 locations are hazardous due to the presence of combustible dust.

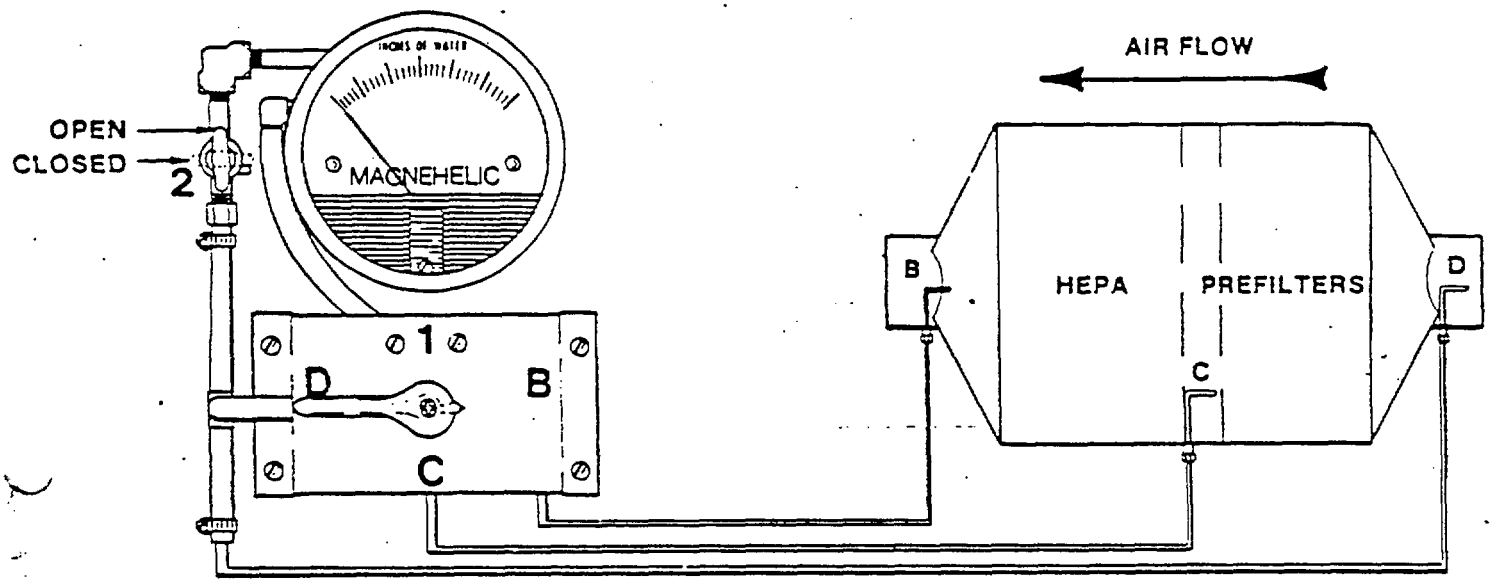
   Class 2, Group E: Atmospheres containing metal dust, including aluminum, magnesium, and their commercial alloys.
   Class 2, Group F: Atmospheres containing black coal, carbon, or coke dust.
   Class 2, Group G: Atmospheres containing flour, grain dust, or starch.

BUILT-IN OVERLOAD PROTECTION

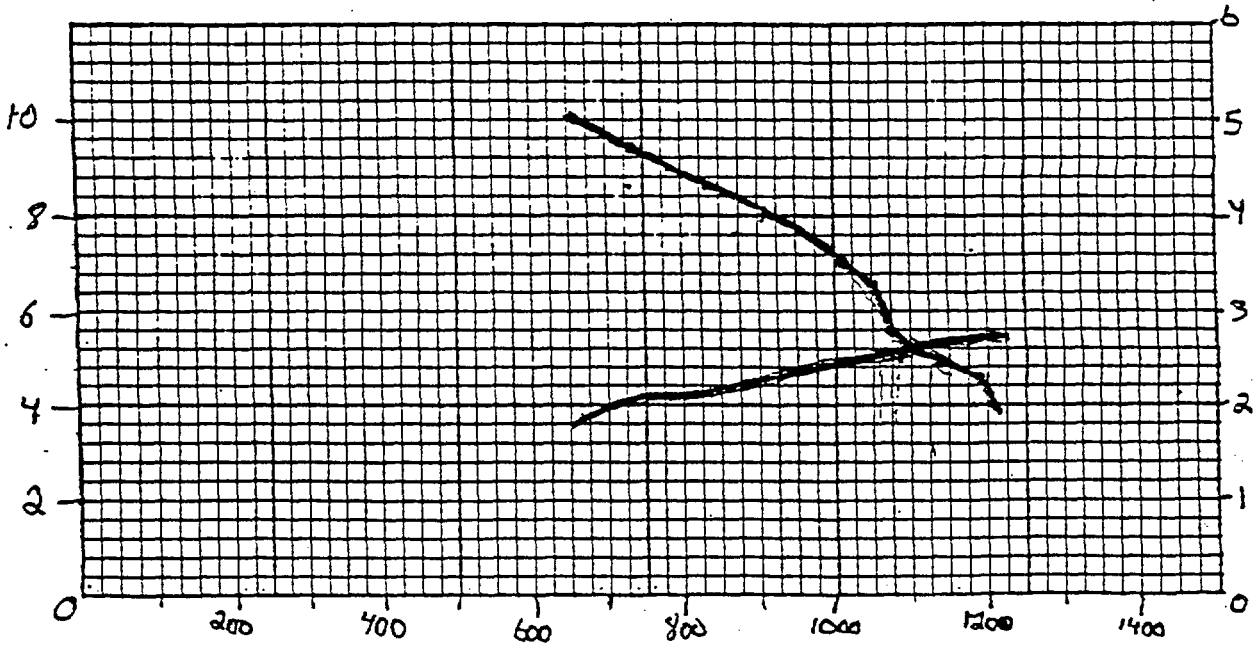
Built-in overload protection is obtainable on all fractional HP single phase motors. The overload protection should be in the switch on all larger single phase and three phase motors.

MAGNEHELIC GAUGE AND VALVE SYSTEM

This system enables the user to measure pressure differential across the prefilter section, the HEPA, all filters, system D/P or inlet duct. The factory tests all ventilators for maximum air flow (CFM) and the pressure readings at all points on the valving system. These tests are performed at full throttle open and with no blower duct. If a ventilator is going to be used for a long period of time in one spot with long lengths of duct, a log can be made up to accommodate this particular usage. Read all points of the valve with clean filters and full open throttle; the ducting need not be removed. Daily records of all points can tell you what the system is doing. If the pre-filter section has increased by 1" to 1 1/2" wg, it may be time to replace the prefilters. If the HEPA section shows it has increased by 1" to 1 1/2" wg with clean prefilters, it may be time to replace it, too. However, always replace the prefilters first.



The performance of this unit, Model # E1000 PC 9A Serial # 1P9A0986-1 has been charted below - Static pressure versus air flow in black, brake horsepower versus air flow in red.



OPERATING CHARACTERISTICS

It is important that the user of the E500, E1000, or E2000 system know the operating characteristics of the unit. The performance/maintenance log (at the end of this manual) should be attached to the unit and completed regularly.

The filters used, the position of the outlet throttle, the length of inlet ducting, the cleanliness of the filters, and the contamination present in the air all influence the operating characteristics of this system. The chart below indicates the clean filter static pressure losses through each filter. It is exceedingly important that the pressure readings for the complete filter system be recorded with all dampers open and the absence of inlet ducting, immediately upon initiating blower operations.

FILTER - DEPTH	1000 CFM*	2000 CFM*
Spark Arrestor 2"	.12" wg.	.35" wg.
Prefilter 4"	.12" wg.	.35" wg.
95% HEPA 6"	.85" wg.	N/A
Moisture Separator 4"	.15" wg.	.30" wg.
99.97% HEPA 11 1/2" "1000" Certified	1.00" wg.	N/A
99.97% HEPA 11 1/2" "2000" Certified	.50" wg.	1.00" wg.

*Flow through single 24" x 24" filter area.

NOTE: These pressure readings are approximate and can easily double if filters are dirty. The prefilter(s) can increase in static back pressure many times the clean reading, and must be cleaned and/or replaced frequently. Internal system static pressure losses, without filters, can be up to 1" wg.

These factory readings are supplied with the:

Model # E1000PC9A

Serial # 1P9A0986-2

Free air flow 1277.2 CFM (clean filters, and open outflow throttle. Filter Option 9

Free air flow pressure differential, in inches of water

across all filters 2.8 wg (B-D settings)

across prefilters .3 wg (C-D settings)

across HEPA 2.5 wg (B-C settings)

Pressure differential in inches of water at 1000 CFM

across all filters 1.7 wg (B-D settings)

across prefilters .5 wg (C-D settings)

across HEPA 1.2 wg (B-C settings)

If applicable pressure differential at _____ CFM

across all filters _____ wg (B-D settings)

across prefilters _____ wg (C-D settings)

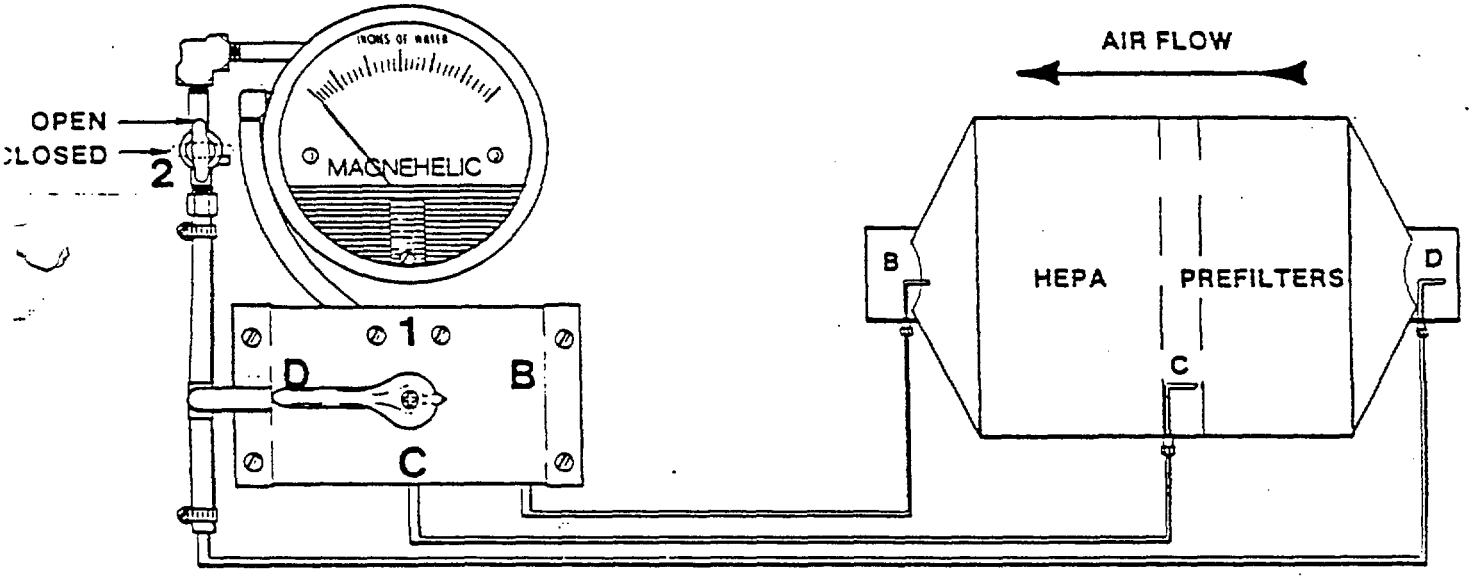
across HEPA _____ wg (B-C settings)

NOTE: These readings are done under factory conditions with clean filters, no inlet ducting, and 20' of outlet ducting. These readings may vary from field conditions and should be retaken for a base-line log entry.

CHECKING PRESSURE DIFFERENTIALS

Closing the small plastic shut-off valve (#2) vents the high side of the gauge to atmospheric. Select position "D" on the three-way valve (#1) to read inlet static pressure and position "B" to read blower static pressure.

To read pressure differentials across the filters, open the small plastic shut-off valve (#2) position "C" to read the differential across the pre-filters and "B" to read the differential across all filters. Subtract the "C" reading from the "B" reading to get the differential across the HEPA.



TO MEASURE	VALVE #1 SETTING	VALVE #2 SETTING
B (STATIC BLOWER)	B	CLOSED
C (STATIC CENTER)	C	CLOSED
D (STATIC INLET)	D	CLOSED
B-D ALL FILTERS	B	OPEN
C-D PREFILTERS	C	OPEN
B-C HEPA	SUBTRACT THE READING C-D FROM B-D	
TO SET GAUGE AT 0	1	CLOSED

The static pressure readings should be logged as the base-line for future system measurements and operating decisions.

FILTER CHANGE-OUT RECOMMENDATIONS

The static losses through a clean filter are given in the chart on page 9. The added sum of the static pressure losses from the clean filters being used should be within 3/4" wg. from the initial measurement (B-D) recorded by the factory prior to shipping.

The filters, as they become dirty, will cause the static pressure at the blower (B) to increase. This pressure increase is what tells the user when to change out a filter.

If the differential pressure across the pre-filters (C-D) increase by one inch of water (wg.), the pre-filters should be changed. The pre-filters can provide adequate filtering even if the differential pressure increases 3 times its factory reading. The change of the pre-filters and the cleaning of the spark arrestor (generally using a mild solvent), should cause the pressure differential across the pre-filters (C-D) to approach the reading recorded by the factory, providing the inlet is not blocked.

If the pressure differential across the HEPA (B-C) has increased by 1" to 1 1/2" wg., it may be time to replace the HEPA filter. The HEPA filter is usually changed out when its static pressure differential increases 2 times its factory reading. Please note that all filter checks should be conducted with inlet ducting off and all dampers open to simulate the same conditions as the initial testing (factory or field base-line).

It is possible to determine the filter status with the ventilator in operation and all ducting in place, if the base-line for this configuration was established and noted on the log. The 3-way valve system provided for the determination of the pressure losses or water gains (wg.) across the pre-filter section, (C-D) only, the HEPA section (B-C) only, the pre-filter and HEPA sections together (B-D) and the inlet (in the ducting) only. Using the enclosed log with its historic data and the 2 and 3 times multiplier for dirty filters "rule of thumb," filter change-out decision can be made in an objective manner. CAUTION: pressure differential comparisons for determining when to change out the filters should take into account the flow rate. Higher pressure differentials reduce flow. The graph showing static pressure versus air flow should be referred to for techniques in adjusting flow. Flow is reduced as filters load up. Compensation can be made by opening up the outflow throttle. The flow rate with the throttle full open can be determined by locating the observed static pressure across the total system (B) on the vertical of the graph, and locating the resulting CFM on the horizontal.

DUCT RESISTANCE AND USE OF FLOW CONTROL DAMPERS

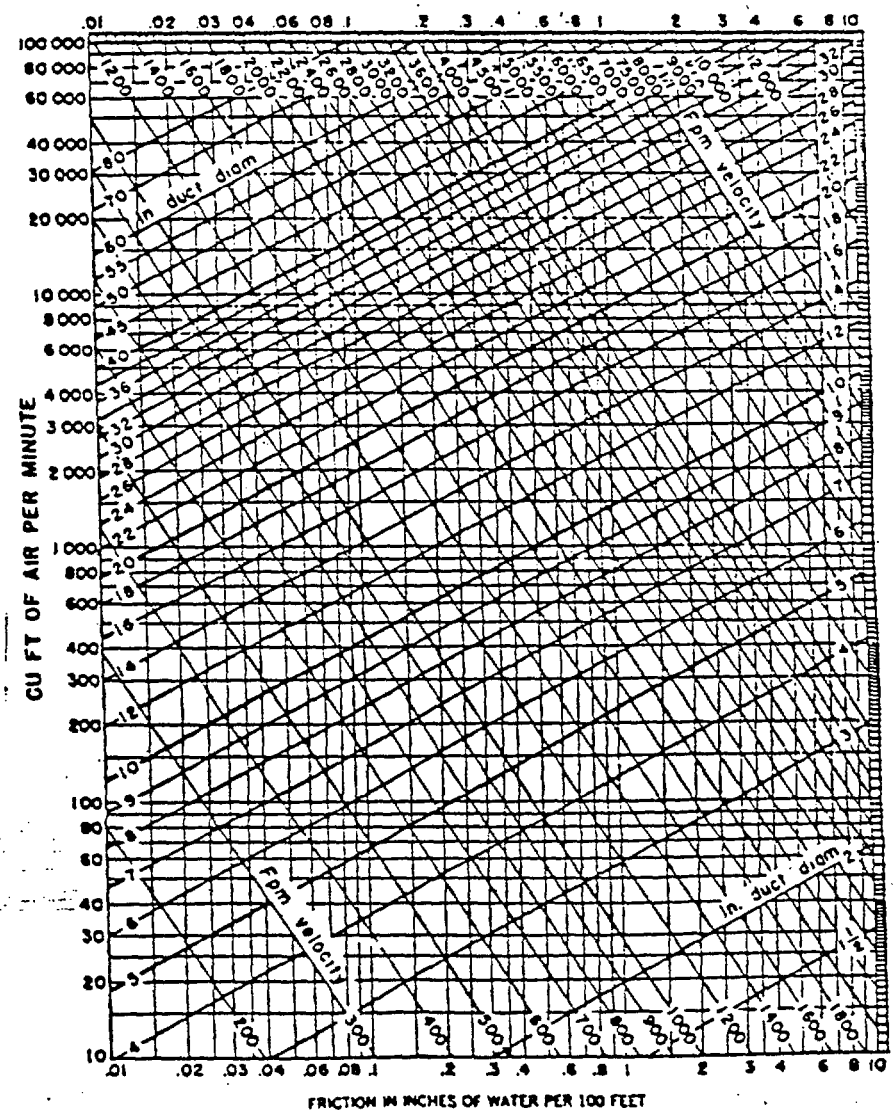
The round duct resistance chart helps you to figure resistance losses in duct systems. The horizontal lines represent air volume (CFM), and the vertical lines represent friction loss in inches of water per 100 feet of duct length. Diagonal lines sloping upward and to the left represent velocity (FPM), an the lines sloping upward and to the right show the diameter of the duct.

EXAMPLE:

Find the friction loss, in., S.P. based on 6,000 CFM through 50 feet of 18" duct. Following the steps just given, we find the velocity in the pipe is 3400 FPM. Directly below the intersection it is found that the friction per 100 feet is .80 for 50 feet the friction will be $\frac{.80 \times 50}{100}$ = .40 in., S.P.

$$\text{In., S.P.} = \frac{\text{In., S.P. for 100 feet} \times \text{Straight Duct in Feet}}{100}$$

DUCT RESISTANCE CHART



It should be noted that the flow rate with clean filters and all dampers open may exceed the 500, 1000, 2000 CFM (See Air Flow Rating page). Operating higher than 500, 1000, or 2000 CFM throughout the filter train is not harmful since all filter stages used can operate at least 50 percent higher than their rated 500, 1000, or 2000 CFM flow rate.

To determine the inlet flow rate, the static pressure versus air flow graph must be used in conjunction with the pressure gauge readout. High flow rates may be available but not desirable to use because of the limitations of the filters. The high static pressure from these high performance blowers may be important in order to use longer lengths of inlet ducting and achieve the desired flow even with dirty filters.

If a constant inlet flow is required as the filters become dirty, adjustments can be made for the decrease in flow rate for dirty filters. It is suggested that the outlet control throttle be partially closed to simulate the reduced flow created by higher static pressures that would be observed with dirty filters. The outflow damper is then opened progressively as the filters become dirty. It would be at the time filter change-out became necessary that the outflow damper would be at its full open position again. The closing down of the outflow damper will not harm the blower motor and reduces the flow without putting excessive vacuum or static pressure on the housing.

Though less desirable, the same constant flow can be achieved using an inlet flow damper and creating a restriction in the inlet flow equivalent to the restriction created by dirty filters. The inlet flow damper is then opened as the filters become dirty and their restriction increases. The inlet flow should never be closed completely.

DOP TESTING AND/OR AIR SAMPLING USING SUPPLIED TEST PORTS

The housing includes a 1/2" NPT plug at the upstream and downstream sides of the filter train. The testing for the integrity of the filters system can be accomplished by utilizing these test ports. DOP testing is a relatively sophisticated test system which is beyond the scope of this manual, and due to some recent health finds, may be used less in the near future. A successful alternative to DOP testing for the integrity of the filter system in the nuclear industry, particularly the absolute filter (HEPA), is the sampling of the air at the inlet and exit ports. This sampling is generally for the determination of radioactive contaminants which may be subsequently checked in a lab. A sucessful filtering of the ventilation system would be determined by observing little or no contaminants in the downstream port when known contamination is observed in the inlet side of the filtering system.

FILTER REPLACEMENT AND MAINTENANCE

The specific techniques by which filters are replaced is the scope of this section. The NPO/PPI ventilation/filtering system uses a unique bag-out capability that will permit the removal of filters without undue contamination of the environment. The housing has 2 access doors so the pre-filters can be removed without opening the housing portion and contaminating the less frequently changed HEPA.

TYPE A BAG, BAG-OUT

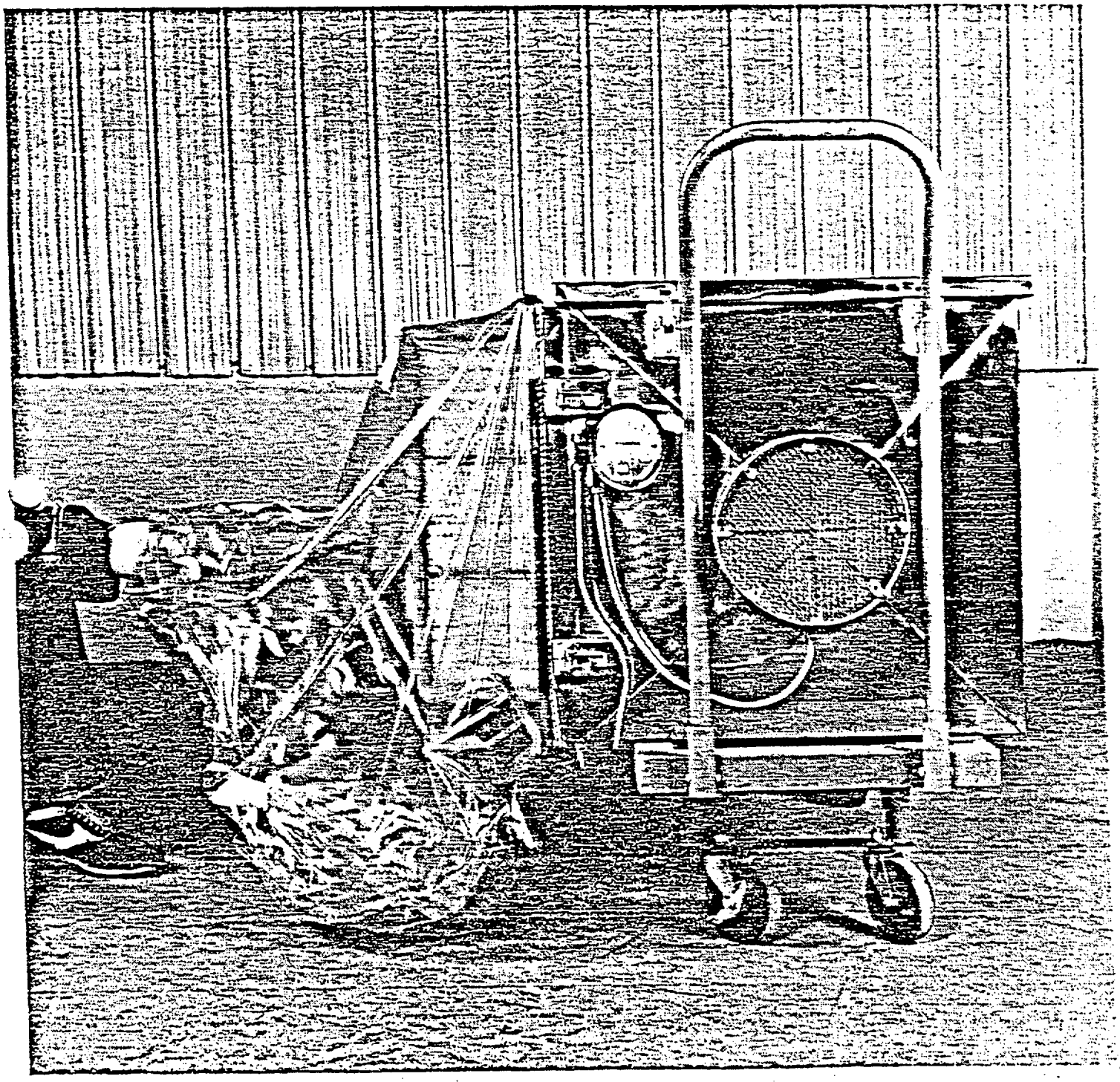
There are 2 techniques for using the bag-out to remove any or all filters. Bag (A), a shorter bag, necessitates pulling out the various filters into the bag with the bag in place and removing the bag in place, and removing the bag from the flange while closing in the open portion of the bag. The installation of a new filter using the (A) size bag is obvious, and does not require the insertion of the filter into the bag prior to installation. It should be installed carefully so that other contaminants in the housing area are not disturbed. The benefit of this approach is that loose contaminants on the filters will not spread beyond the housing.

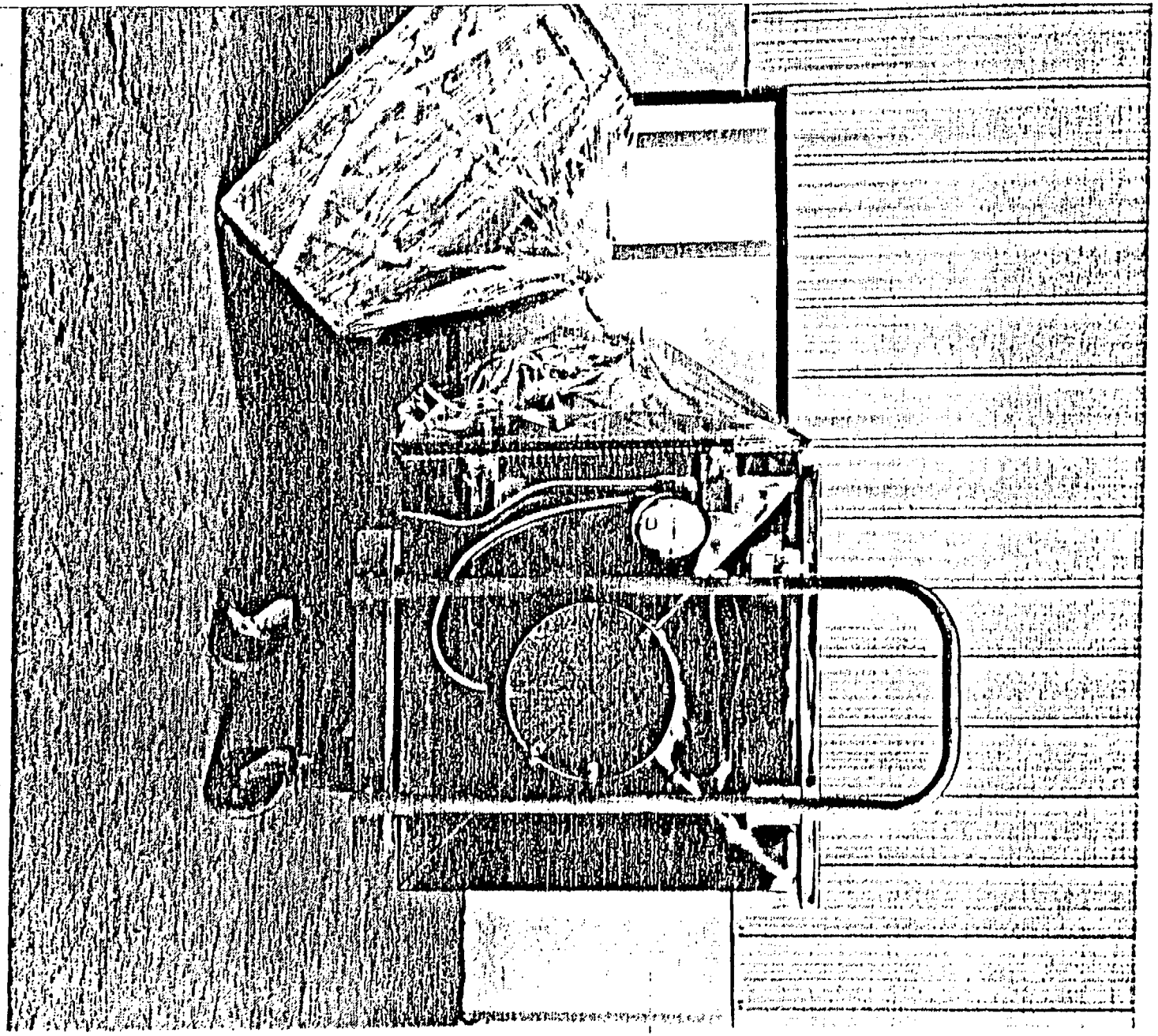
The second technique is utilizing the longer (B) size bag and is a true bag-out approach. The integrity of the bag and housing is unbroken in this approach. This technique is demonstrated in the photos on the next pages and described in the writing below.

Photo #1 - Remove the rubber plugs on the opposite side of the filter doors. Just inside the cabinet is a slotted, threaded rod which tightens or loosens the clamping mechanism on the HEPA. Use a heavy duty screwdriver, turn counter-clockwise to loosen until clamping mechanism stops. Loosen both top and bottom clamps. If just the pre-filters are being changed, there is no need to loosen the clamping mechanism, although it would be a good time to tigten the clamps since the ventilation unit is not being used. Unlatch and open the door that will be bagged out; inside is a PVC bag. Unfold it, but don't remove the bag from the cabinet. With the bag unfolded and loosened, reach into the ventilation unit with the PVC bag, and pull the filter(s) into the bag.

Photo #2 - With the filter at the end of the bag, twist the filter and bag into a tight 4" to 5" tie. Then rap tape around the twisted bag tightly. With a sharp knife cut the tie in the middle, leaving two taped ends - one on the bagged filter(s) and the other on the sealed cabinet. (See Photo #3.)

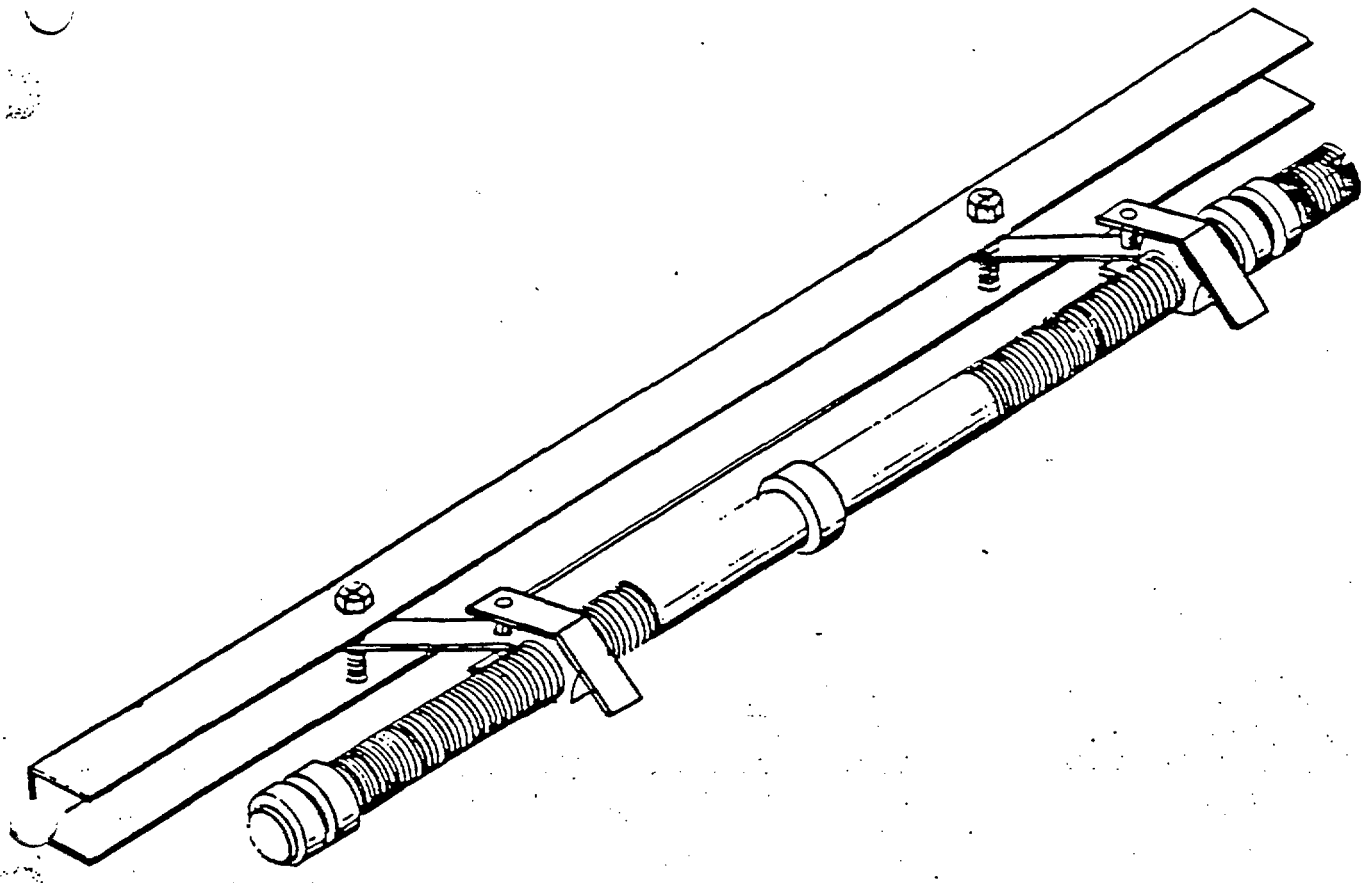
Photo #4 - Take a new replacement filter(s) and place it inside a new PVC bag; make sure that the filter is placed inside the bag so that it allows for easy loading and so that the air flow marking on the filter(s) is pointing in the right direction. Stretch the new bag over the remainder of the old bag. Remove the corners of the old bag from the ventilator and pull off using the new bag to grab the tie. Leave the remainer of the old bag inside and arrange the filter(s) to pass by and enter the ventilator. Make sure the filter(s) is all the way in, especially the HEPA. If not, the HEPA could have bypass and not give proper protection. If the HEPA was changed, the clamping mechanism needs to be tightened; turn clockwise. Snug both top and bottom clamps, then tigten as you would a wood screw - enough to do the job without stripping the hole. Replace the rubber plugs. Refold the bag to fit between the inside of the door and the filters. Latch doors closed.





KNIFE EDGE AND CLAMP HEPA

The pre-filter stages are removed by simply sliding the filters out horizontally along the filter track. The exception is the HEPA filter which seals up against a knife edge on the downstream side. The neoprene is compressed against this knife edge using a simple but exceedingly effective screw-type locking mechanism at the top and bottom of the upstream side of the HEPA filter. This locking mechanism has its access through the side of the housing at the top and bottom through a 3/4" port covered by an expandable rubber plug. To remove the HEPA filter, carefully remove the plugs and then using a medium-sized screwdriver, turn counter-clockwise the slotted head just inside of the ports. Four to six turns of the screw will open the locking clamps internally and free the filter. When reinstalling the HEPA, reverse the procedure, turning the screwdriver clockwise until a significant resistance is met similar to what would be obtained by a wood screw in wood (do not overturn and bear down with excessive force). A penetration can be observed in the old HEPA's neoprene where the knife edge sealed. This penetration should lie near the center of the neoprene and show consistent penetration all the way around the HEPA



TERMS AND DEFINITIONS

AHP - Air horsepower. Work done by the fan expressed as horsepower.

$$AHP = \frac{CFM \times TP}{6356}$$

BHP - Brake horsepower. The horsepower absorbed by the fan.
BTU - British thermal unit. The amount of heat required to raise one pound of water from 63°F to 64°F.
CFM - Cubic feet per minute. The volume of air moved per minute.
EDR - Equivalent direct radiation. The amount of heating surface which will give off 240 BTU per hour.
FPM - Feet per minute. The velocity of the airstream.
Final Temperature - The temperature of air after passing over heating coils under specified conditions.
Free Delivery - The condition under which a fan operates when no static pressure or resistance is present.
HP - Horsepower. The actual rated output of the fan motor used.
ME - Mechanical efficiency. The ratio of horsepower absorbed (BHP) to horsepower delivered by the fan (AHP).

$$ME = \frac{AHP}{BHP}$$

Plenum Chamber - An air compartment maintained under pressure to serve one or more distributing ducts.
RPM - Revolutions per minute. The number of times the fan shaft revolves per minute.
Standard Air - Air which weighs .075 pounds per cubic foot, which is dry air at 70 F dry bulb with a barometric pressure of 29.92 inches of mercury.
SE - Static Efficiency. Expressed as:

$$SE = \frac{CFM \times SP}{6356 \times BHP}$$

SP - Static Pressure. A measure of the force exerted by the fan in moving air through any ventilating system.
TS - Tip-Speed. The peripheral speed in feet per minute of a propeller tip at any specified RPM.
TE - Total efficiency. Expressed as:

$$TE = \frac{CFM \times TP}{6356 \times BHP}$$

TP - Total pressure. The sum of the static pressure (SP) and the velocity pressure (VP) at any given point in a ventilating system.
VP - Velocity pressure - Equal to the kinetic energy per unit volume of the flowing air. It can be calculated from the formula:

$$VP = \frac{FPM}{4005}$$

HELPFUL ENGINEERING FORMULAS

Velocity = CFM ÷ Duct Area (in Square Feet)

ALTERNATE METHOD:

$$\text{Velocity} = \frac{CFM \times 144}{\text{Duct Area (in Square Inches)}}$$

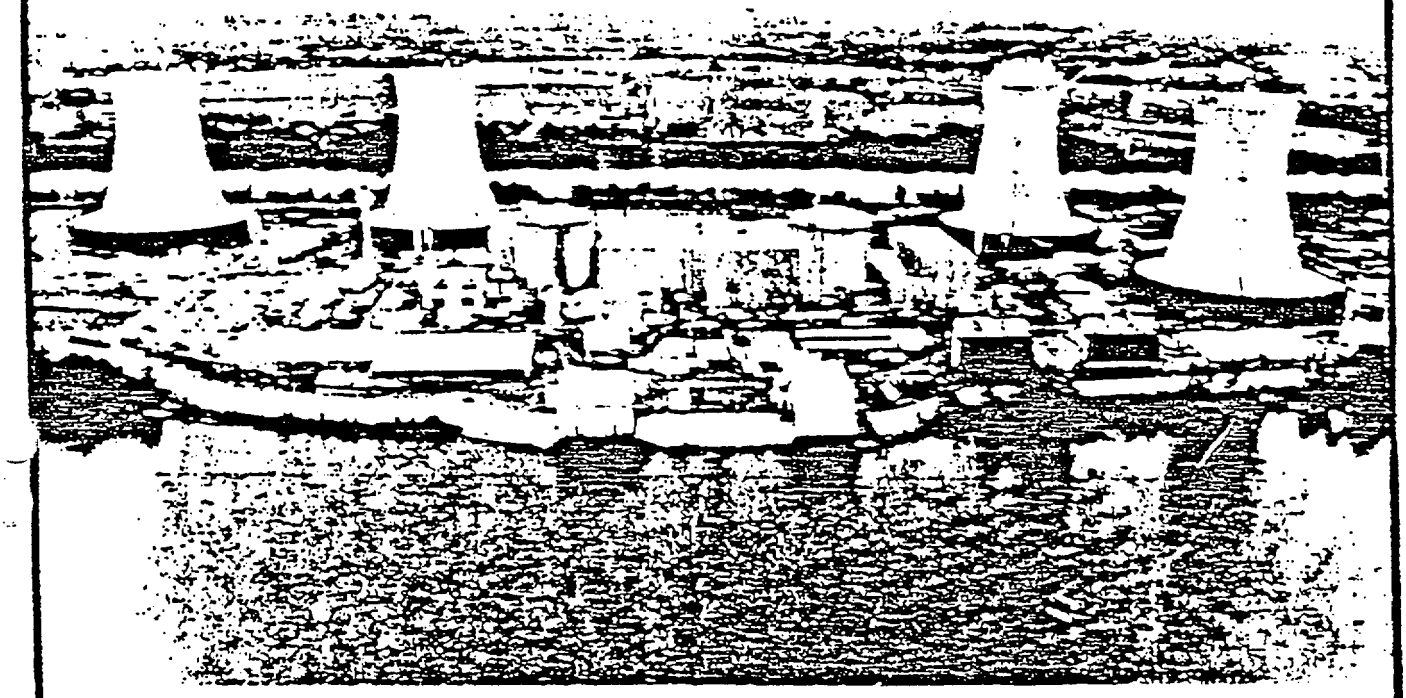
CFM = Velocity x Duct Area (in Square Feet)

ALTERNATE METHOD:

$$CFM = \frac{\text{Velocity} \times \text{Duct Area (in Square Inches)}}{144}$$

Tip Speed = Circumference x RPM

Flanders®



Flanders Nuclear Grade Hepa Filters

Type B Filter

per IES CS-1T

Each Flanders hepa filter is tested at the factory to meet the requirements of IES CS-1T. Test results are recorded upon the filter label. It is the policy of Flanders to recommend that all hepa filters also be tested in service by qualified personnel to ensure that the filters have not been damaged during shipping and handling and that they have been correctly installed. Where required, Flanders factory trained personnel are available for installation, supervision of installation by others, testing and certification of compliance to industry and government standards.

Quotations for all nuclear products must be submitted by a Flanders factory office or by a Flanders representative with a Nuclear Sales Agreement. Although Flanders Nuclear Grade Hepa Filters meet most DOE operated facility specifications and NRC licensed reator specifications, conflicts may exist. Complete owner/operator specifications and requirements must be submitted before firm quotations can be given.

Budget quotations are usually required by systems planners to assist in product evaluation, selection and budget development during the design phases of new construction projects or facilities upgrade projects. Estimators are urged to request all applicable specifications and requirements from the facility owner/operator including seismic, QA program, packing, retest, faceguards or special filter features. Only then can accurate budgets be quoted.

Flanders Nuclear Grade Hepa Filters

Application and Qualification

Flanders Nuclear Grade Hepa Filters are widely used in nuclear service in U.S. Department of Energy (DOE) test reactors, nuclear research laboratories, radioactive waste treatment plants, nuclear weapons facilities, fuel process plants and fuel storage terminals. Within the regulatory jurisdiction of the U.S. Nuclear Regulatory Commission (NRC) Flanders filters are used in many commercial nuclear generating reactors and ancillary facilities.

The qualification of hepa filters for nuclear service takes many forms. The military standard MIL-F-51068 was written originally for military use and many component parts have been adopted in specifications written by the prime contractors to DOE or by licensees of the NRC. Flanders manufactures Nuclear Grade Hepa Filters in accordance with the essential construction requirements of MIL-F-51068 (latest issue). Where DOE, NRC or buyer specifications conflict with the military standard, the buyers requirements are accepted as a waiver of the military standard requirements

To meet MIL-F-51068, filters must be submitted to both Edgewood Arsenal and Underwriters Laboratories for extensive testing including spot flame, environmental exposure, heated air and rough handling tests. Following the successful completion of these programs the manufacturer is put upon the Qualified Products List (QPL) by Edgewood Arsenal and is accepted for listing under UL 586.

Nuclear Grade Hepa Filters meet the requirements for performance, testing and construction specified in IES CS-1T for Type B Filters and are tested in accordance with Mil-Std-282 while encapsulated at two flows, for resistance and penetration at the nominal rated capacity listed in paragraph 1.2.1 of MIL-F-51068 (or, if flows and resistance are not listed at flows proportional to those listed values after factors for physical constraints are considered) and, for penetration at 20% of the nominal rated capacity. The penetration at both test flows cannot exceed .03% and the filters are labelled and certified to have an efficiency of no less than 99.97% on a challenge aerosol having a homogenous particle size of 0.3 μm. The test results appear upon the filter label, the carton label and upon a Test and Certification of Compliance Report which is sent to the buyer.

Nuclear facilities operated for DOE require that their hepa filters be tested for resistance and penetration by the manufacturer and again by one of the three Quality Assurance Stations operated for DOE. This service must be purchased by the buyer and final acceptance or rejection is at the Quality Assurance Station. Filters which are rejected at the test station as not conforming to the specifications agreed to by both buyer and seller, and which are determined not to have been rejected because of damage in shipment, will be replaced at no cost to the buyer. IMPORTANT If filters are required to be retested at a Quality Assurance Station, the

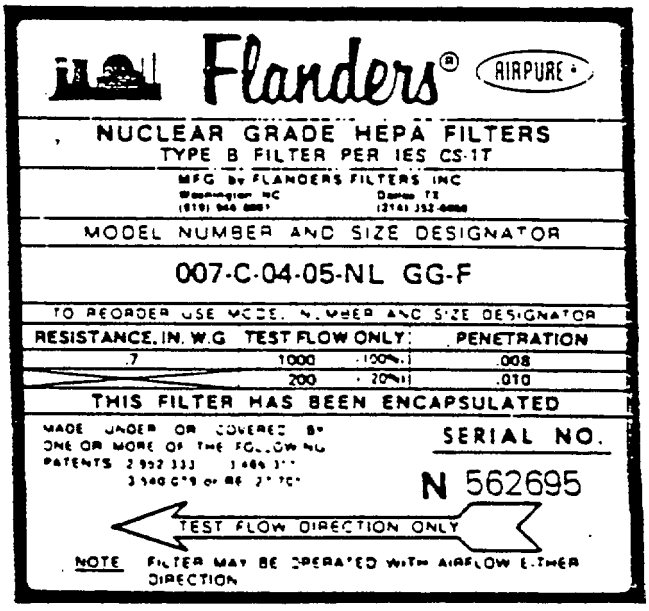


Figure 1
A Flanders Nuclear Grade Filter Label indicating that the filter has been tested for efficiency at two flows while encapsulated.

re irement must be made known before
a ations can be given. They must be shipped
directly from the factory to the retest facility.
lters which have been double or triple shipped
ill not be replaced if rejected.

In accordance with the requirements of ANSI 45.2, evidenct of Flanders' Quality Assurance Program can be submitted for inspection. Seismic data is available to commercial reactors operating under NRC license as well as to operating DOE facilities In a unique program, Flanders hepa filters were operated continuously during a series of simulated earthquakes while being simultaneously tested for efficiency for the duration of the tests. There were no failures.

Environmental Conditions

It is not possible for Flanders Filters, Inc. to anticipate all conditions under which filters and filter products will be used. Operation at elevated temperatures is relatively common and, except for a burnout of the organics in the binder at 300° - 325° F, no noticeable change occurs in performance. Glass media have been operated as high as 1000° F and have been retested for efficiency at ambient temperatures. Exposure to acids such as HF, and those with NO_x radicals occurs in nuclear process systems with some regularity and with varying degrees of success (HF attacks glass). The resistance to chemical or environmental factors of the other components used in the construction of the filters is often available from the manufac- rs, but the combined effects of humidity, emical agents and heated air upon filters and the terrelationship of the construction materials is nknown. Therefore, the information given herein is offered as a general guide to the system designer. If specific data relative to anticipated potentially degrading operating conditions is required, Flanders offers destructive environmental testing, for a fee, as a service to filter users.

Humidity and Water Resistance

Hepa filter media are treated with a water resistant binder and will tolerate both high humidity and direct wetting, however, excessive amounts of moisture, either from airborne droplets or condensation on the element, can completely plug the filter and can result in failure by overpressure. Filters with fire retardent plywood frames are unsuitable for systems having high moisture content since wood materials expand and warp when wet. Further, they can support biological growth under humid conditions. Consequently, metal frame filters are more suitable for moisture laden atmospheres. Aluminum separators can corrode in certain environments and can slough particulates downstream of the filter. The urethane sealants have successfully passed moisture tests during QPL and UL qualification.

Chemical Resistance

All materials have good resistance to most organic solvents and are resistant to many weak organic and inorganic alkalies and acids.

Maximum Surge Temperature

The filters are constructed from either fire retardant (self-extinguishing) or incombustible components and have been tested continuously at temperatures above the 250° F recommended for maximum, periodic service for twelve hours or more. Subsequent to the exposure they passed a second efficiency test. All components have been successfully tested for listing by Underwriters Laboratories for UL 586 and for the qualified Products List (QPL) at Edgewood Arsenal. In both procedures the filters were exposed to temperatures of 700° F ±50° F for a fifteen minute period. Following these heated air tests the filters were retested for efficiency and, to qualify, the loss could not exceed 3.0%. CAUTION: Extended or repeated use of filters at elevated temperatures cause organic materials which have been treated with fire retarding chemicals to accelerate in the aging process, to char and to dry out and become brittle.

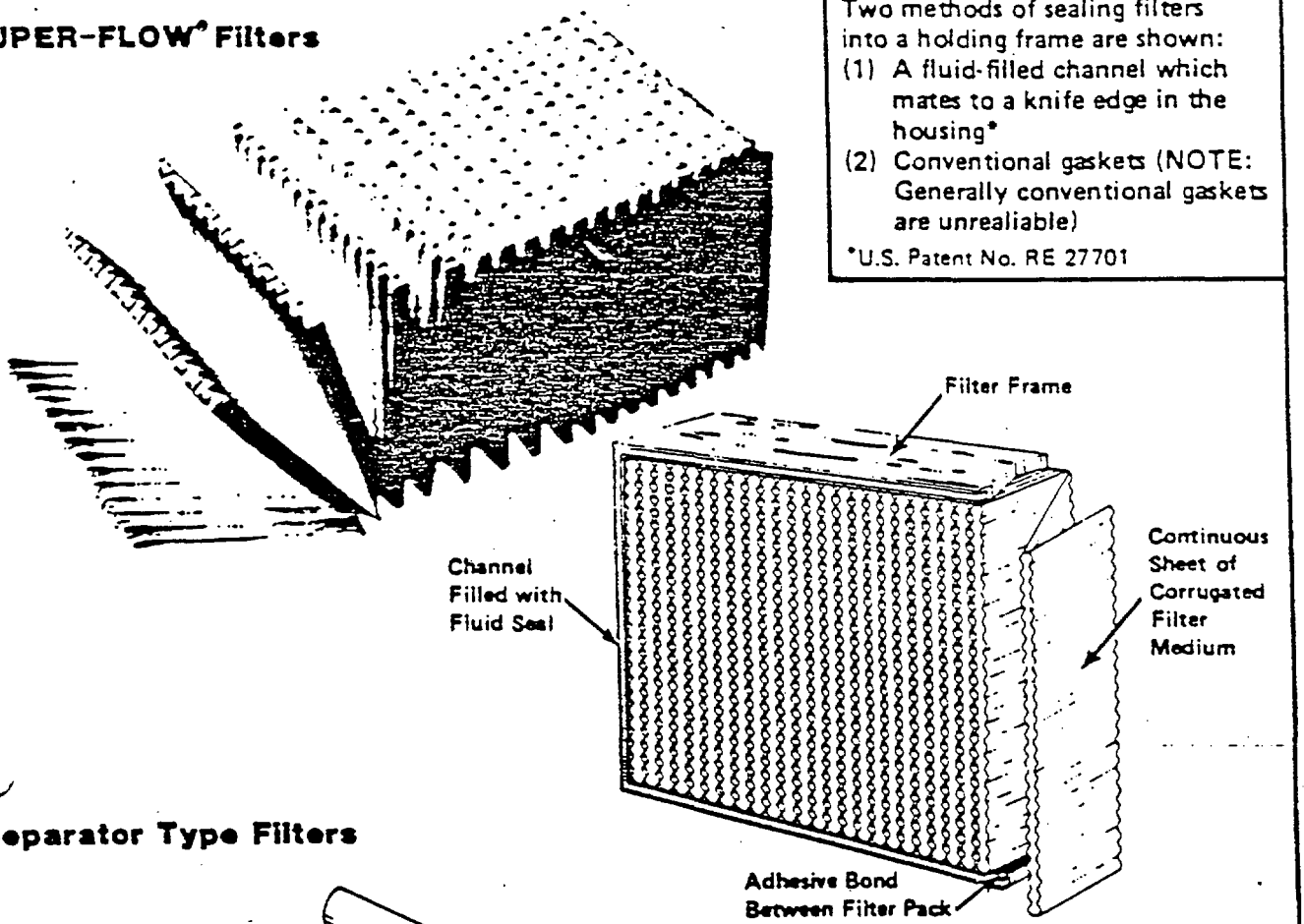
Filter Design and Construction

Two types of filters are described in this section, filters with separators to space adjacent pleats of the filter element and a self-supporting element called SUPER-FLOW®. Flanders manufactures all of its glass filter media on a paper-making process adapted for use with boron silicate microfibers to meet or exceed the requirements of MIL-F-51079 (latest issue). The flat sheet medium is pleated

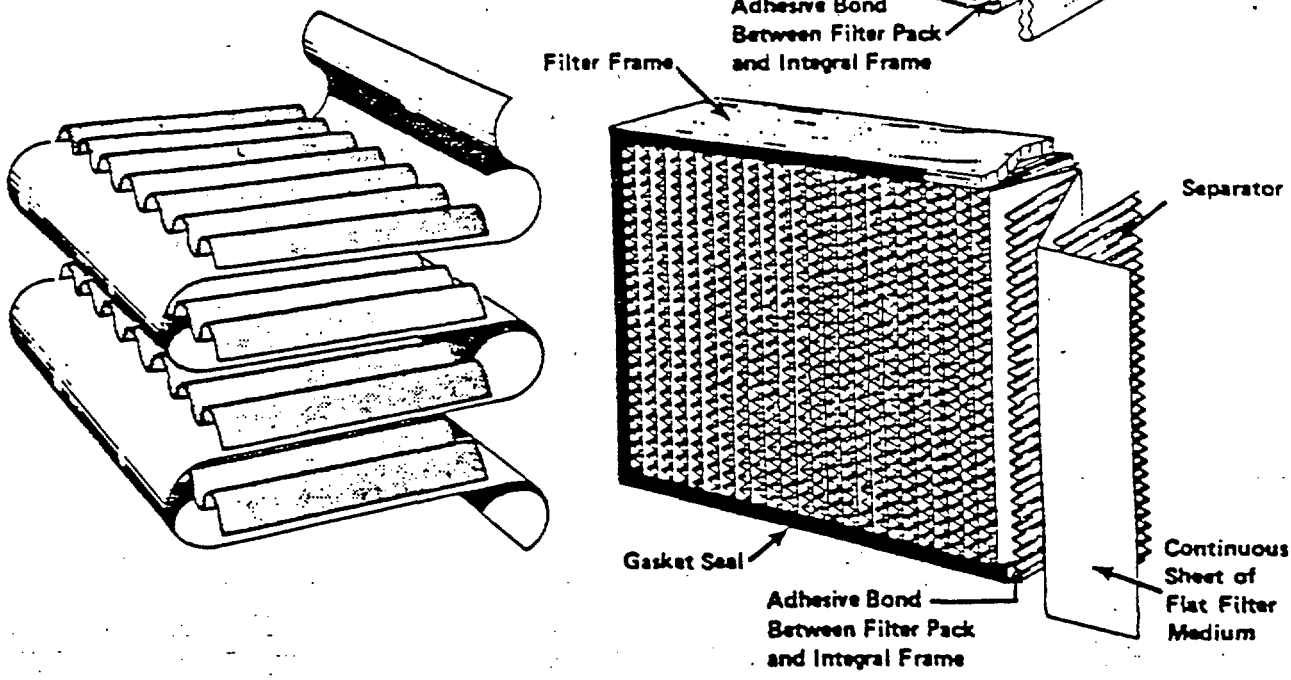
SUPER-FLOW® Filters

Two methods of sealing filters into a holding frame are shown:
(1) A fluid-filled channel which mates to a knife edge in the housing*
(2) Conventional gaskets (NOTE: Generally conventional gaskets are unrealiable)

*U.S. Patent No. RE 27701



Separator Type Filters



ure 2 - The SUPER-FLOW® design uses a formed, corrugated medium which is pleated back and forth over itself. Separator Type Filters use a flat sheet of medium pleated back and forth over corrugated aluminum separators.

back and forth across corrugated aluminum separators which allow the air to penetrate the farthest part of the pleat. The SUPER-FLOW® design uses a formed, corrugated medium which achieves the same purpose without the use of separators. The machinery used to manufacture the SUPER-FLOW® elements is a Flanders innovation and is integral to the paper-making process.

SUPER-FLOW® filters have fewer pleats than separator type filters. However, at least 20% of the surface area of a separator type filter is unable to collect particulate material in service because of obstruction by the separators. Adjacent SUPER-FLOW® pleats are also in contact, but whereas dismantled separator type filter elements have sharp delineations between the loaded and clean areas of the surface, SUPER-FLOW® packs show loading across the entire surface, apparently due to a lateral migration of particulates between contiguous layers of fibrous material. Consequently, more area is available with a SUPER-FLOW® filter.

The SUPER FLOW® medium has an average thickness of 21 mils compared to the average 17.5 mils of Flanders flat sheet and the minimum 15 mils specified in MIL-F-51079. The heavier medium enhances the SUPER-FLOW® type of construction, causes a higher initial pressure drop, (relative to SUPER-FLOW® medium that is not as thick) but increases strength and dust holding capacity since in addition to more surface area there is 40% more fiber content than required, thereby increasing the expected service life.

Extended service life of filters in nuclear air cleaning systems reduces down time and maintenance exposure unless filters are changed because of high radiation rather than high dust loading. SUPER-FLOW® filters are also more desirable than separator type filters after they have been removed from service since there is less material to dispose. On the average, SUPER-FLOW® filters (24" x 24" x 11-1/2") weigh eight pounds less than filters with aluminum separators.

Fire retardant urethane sealants are used to bond the filter element to its integral frame. SUPER-FLOW® filters are made on the solid urethane production line whereas separator type filters are made with polyurethane foam. These sealants are used with a particular element as a production aid, but in fact, are interchangeable in performance and in qualification. At the option of Flanders, one may be substituted for another to facilitate production scheduling.

Mishandling during shipping, unpackaging and filter installation can cause damage to all hepa filters. Separator type filters are susceptible to tearing of the medium by sharp corners on the separators. Flanders aluminum separators are hemmed on both edges to resist tearing of the medium.

Fire retardant plywood frame filters are used at many facilities operated for the DOE and are easier to incinerate or break down for storage than are metal frame filters. In recent years the quality of available fire retardant plywood has diminished and DOE is currently considering an untreated plywood as a substitute material.

Two types of stainless steel frame filters are available. The 14 gage, type 409 stainless steel is used in place of the 16 gage cadmium plated steel and the 14 gage chromized steel used in the past. The type 409 stainless has a relatively low resistance to caustic atmospheres and type 304 stainless steel is recommended for those applications.

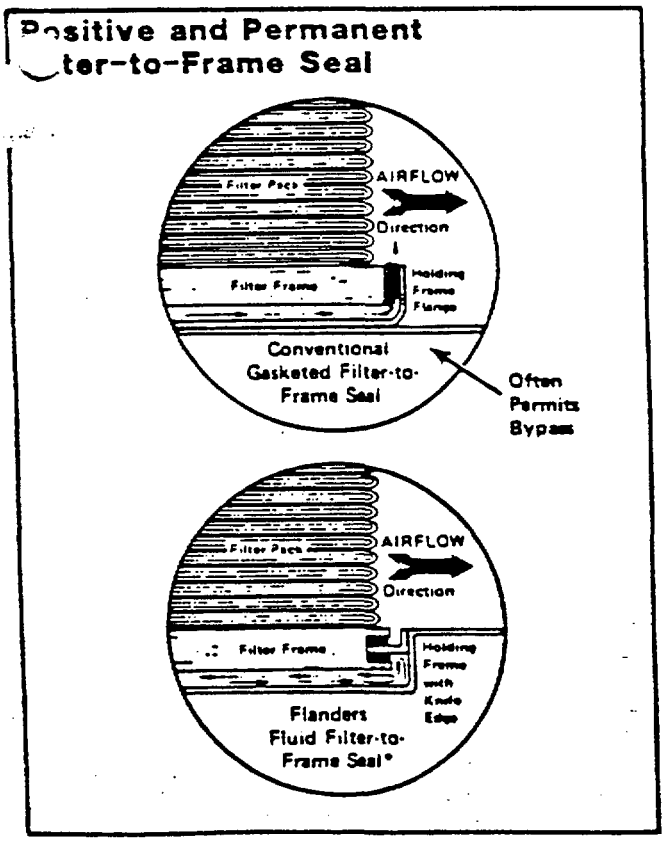


Figure 4

Flanders manufactures filters with either neoprene gaskets or with fluid seal.* Gaskets are not recommended since bypass problems are frequently encountered with their use. Fluid seal filters are supplied with a groove or channel at the perimeter of one face. The channel is filled with a viscuous material (silicone base) which mates to a knife edge built into the filter retainer or housing. Fluid seal installations will pass in-service tests with undamaged, properly selected filters. All field test procedures should be reviewed with the Flanders factory service department.

Flanders invented the fluid filter-to-frame seal to eliminate bypass due to relaxation or "loss of memory" of gasket material that has been compressed for a period of time. Bypass also occurs because of the separation of gasket joints, imperfections in the gasket or mounting frame, or misalignment at the interface of gasket and mounting frame when the frame is not perfectly flat. The fluid is a highly viscuous, non-Newtonian, non-evaporating substance which adheres to the mating components of the filter and its mounting frame. The material will not relax, flows around and over imperfections and will not separate. The fluid seal is guaranteed to pass an in-place test when used with correctly selected and installed Flanders housings and undamaged filters.

Nuclear Grade Hepa Filters with fluid seal are designed for use in Flanders NBC-4, E-4, G-1 or H-1 filter housings all of which are available with code welding, pressure decay leak testing, seismic and QA program options required by the nuclear industry. Accessory in-place test equipment can be installed into most Flanders housings for remote in-place testing. In systems designed without the use of built in in-place test equipment the satisfactory performance of an in-place test is dependent upon system layout and system designers are urged to contact Flanders for recommendations. Flanders service personnel are available for supervision of installation and filter handling as well as for field testing and certification.

Both galvanized and stainless steel faceguards are available as an option. Faceguards add a measure of protection, but should not be considered a guarantee against damage due to mishandling.

* U.S. Patent No. RE 27701

Packaging/Palletizing

The successful delivery of undamaged hepa filters depends largely upon good packing. Experience has shown that shipping damage to filters has been minimized by encasing each filter in a tight-fitting linerboard sleeve that is flanged outward at its top and bottom and then inserting the sleeved filter into a linerboard carton having a folded linerboard cushion in the top and bottom. This results in a 1-1/2" dead air space around the filter to absorb impact. All filters that are 24" x 12" x 5-7/8" and larger are packaged in this manner. Additionally, all Nuclear Grade Filters are palletized for shipment in groups of cartoned filters stacked side-by-side, 3/8" plywood facing at the two most vulnerable ends and the aggregate strapped to the pallet.

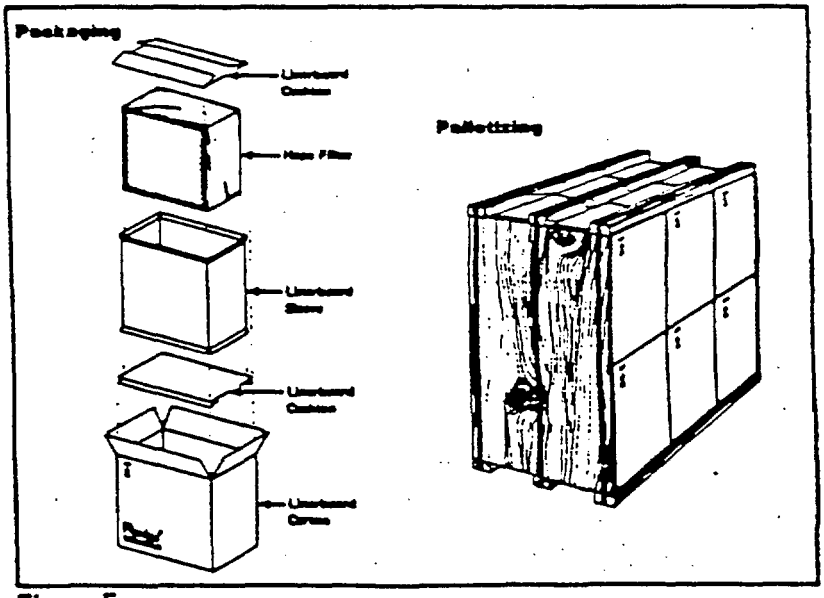


Figure 5

Ordering Information

Flanders filter model numbers and size designators are coded for the type and efficiency of the filter medium, specific construction materials, frame style, filter grade and outside dimensions.

Filter Medium and Efficiency	Non Woven Glass Paper (Boron Silicate Microfibers), 99.97% Minimum Efficiency by DOP Test. Tested at 100% and 20% of Nominal Rated Capacity per MIL-F-51068 (Latest Issue) While Encapsulated Type B Filter per IES CS-1T	007	007
SUPER-FLOW® or Separators	Self-Supporting SUPER-FLOW®	0	0
	Flat Sheet Pleated Over .0015" Minimum Thickness Corrugated Aluminum Separators with Hemmed Edges.	C	
Frame Material	3/4" Fire Retardant Plywood	04	04
	14 Gage, Type 409 Stainless Steel	02	
	14 Gage, Type 304 Stainless Steel	03	
Frame Style	No Flanges "Box Type" Neoprene Gaskets One or Both Sides per Customer Option	00	
	Double Turn Flanges Both Faces, Neoprene Gaskets One or Both Sides per Customer Option	03	
	No Flanges "Box Type" Routed Channel for Fluid One Side or Double Turn Flange One Face, Channel for Fluid Other Face	05	05
Sealant	Fire Retardant Solid Urethane	NU	NU
	Fire Retardant Polyurethane Foam	NL	

Use this chart for quick reference only. (See pages 8-11 for further details)

Example: Model 007-0-04-05-NU Size (GG-F)

- Filter Medium
- Separator Material/Spacing
- Frame Material
- Frame Style
- Filter Grade and Sealant
- Size Designator

Previous Model Number: 7 0 4 5 - NU (GG-F)

(As shown by the dotted lines, the previous model numbering code has been expanded to allow for the inclusion and substitution of materials used to construct filters.)

Important:

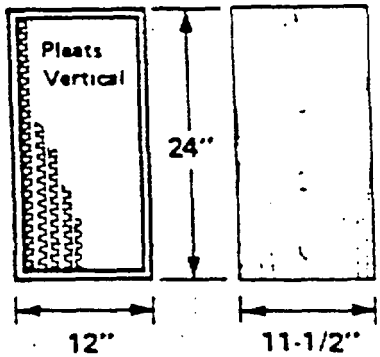
Hepa filters should be installed with the pleats aligned with the vertical axis when the airflow is horizontal. This prevents sagging and potential tearing of the medium as the filter becomes loaded with dust in service. When specifying filter sizes or size designators, the height demension should be given first.

Example:

24" x 12" x 11-1/2"

or

Size (GC-F)



To Order:

Use the model number, the size designator and specify the location of the gasket or fluid-filled channel, e.g. the upstream (air entering) or downstream (air leaving) side of the filter. The latter is important because the filters are tested for resistance and efficiency in one direction and labeled with a directional arrow that states, "TEST FLOW DIRECTION ONLY"

Specifications and Ordering Information

Optional Items and Items Which Must Be Specified Apart From the Model Number and Size Designator:

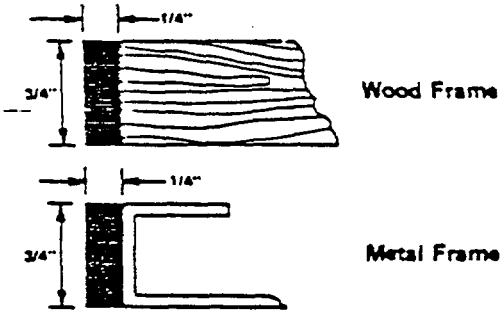
Underwriters Laboratory Listing, UL 900

The hepa filters described herein are classified by Underwriters Laboratories, Inc. as to flammability only and are listed as Class 1. This is not a requirement of the nuclear industry, but is a frequent requirement of the construction industry where smoke emmission is of major concern. Class 1 labels are optional and are applied to the filter only when specified by the buyer.

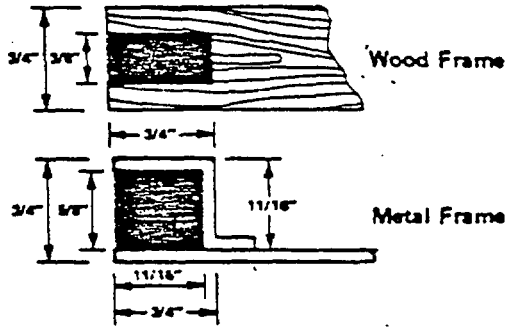
Filter-to-Frame Seal, Upstream or Downstream Side

Standard gaskets are made from 1/4" x 3/4" closed cell neoprene material. Fluid seal filters are supplied with a routed 3/8" x 3/4" deep channel on wood frame filters or a 5/8" x 11/16" deep channel on metal frame filters. Specify upstream or downstream location of the gasket or fluid seal. (NOTE: Filters are tested for resistance and efficiency in one direction and labelled, **"TEST FLOW DIRECTION ONLY"** although they can be operated in either direction.)

Neoprene Gaskets



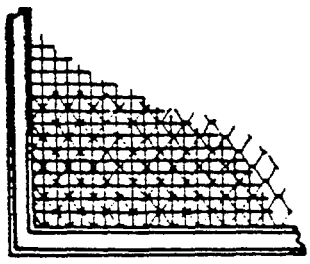
Fluid Filter-to-Frame Seal*



*U.S. Patent No. RE 27701

Faceguards

The standard faceguard material is number 4 mesh, 23 gage, welded and galvanized dip. Type 304 stainless steel faceguards are also available for highly corrosive atmospheres. This material is number 4 mesh, 17 gage woven wire per ASTM A276. Specify faceguard location as upstream, downstream or both sides. Faceguards are optional except on all SUPER-FLOW® filters in sizes GG-F, GN-F and YY-F where they are standard.

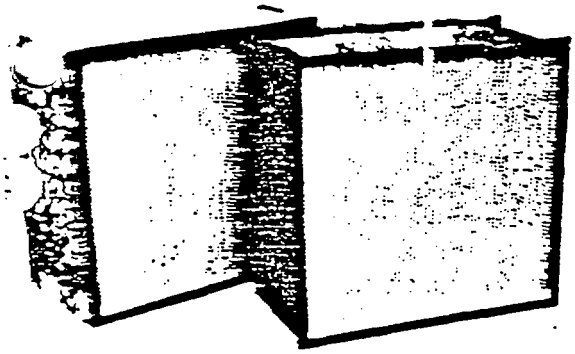


To Order

Use the filter model number, the size designator, the location of the gasket or fluid filled channel (upstream or downstream side) and any required option.

Example: 007 - 0 - 02 - 05 - NL (GG-F),

Fluid downstream only, Galvanized faceguards both sides.



Nuclear Grade Separator Type Hepa Filters Gasket Seal

Model Number	Filter Element	Separator	Frame Material	Frame Style	Sealant
007 - C - 04 - 00 - NL (7C40-NL)	Non Woven Glass Paper (Boron Silicate Micro-Fibers), Flat Sheet Pleated over Corrugated Separators, 99.97% Minimum Efficiency by DOP Test. Tested at 100% and 20% of Nominal Rated Capacity per MIL-F-51068 (Latest Issue) While Encapsulated. Type B Filter per IES CS-1T.	.0015" Minimum Thickness Corrugated Aluminum with Hemmed Edges	3/4" Fire Retardant Plywood	No Flanges "Box Type" Neoprene Gaskets One or Both Faces per Buyer Option	Fire Retardant Polyurethane Foam
007 - C - 02 - 03 - NL (7C23-NL)			14 Gage Type 409 Stainless Steel	Double Turn Flanges Both Faces, Neoprene Gaskets One or Both Faces per Buyer Option	
007 - C - 03 - 03 - NL (7C33-NL)			14 Gage Type 304 Stainless Steel		

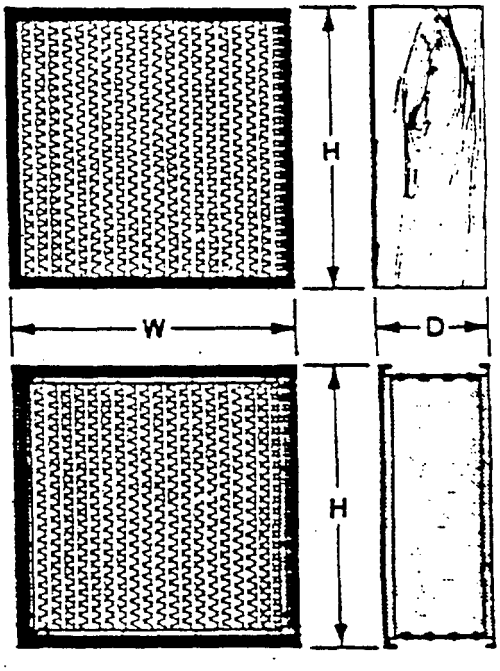
( ) = Denotes Previous Model Number for this Filter

Designator for Filter Sizes					
H	W	D	Designator	Nominal Rated Capacity	Average Initial** Resistance, Inches w.g.
8"	8"	5-7/8"	88-D	35	1.0**
12"	12"	5-7/8"	CC-D	105	0.62**
24"	12"	5-7/8"	GC-D*	225	
24"	18"	5-7/8"	GE-D*	365	
24"	24"	5-7/8"	GG-D	500	
12"	12"	11-1/2"	CC-F*	160	0.82**
24"	12"	11-1/2"	GC-F*	455	
24"	18"	11-1/2"	GE-F*	725	
24"	24"	11-1/2"	GG-F	1000	
24"	30"	11-1/2"	GN-F*	1275	

*Not listed in MIL-F-51068 (latest issue). Filters larger than 24" x 24" x 11-1/2" are not eligible for UL 586.

**See page 13 for additional information on filter selection.

Wood Frame



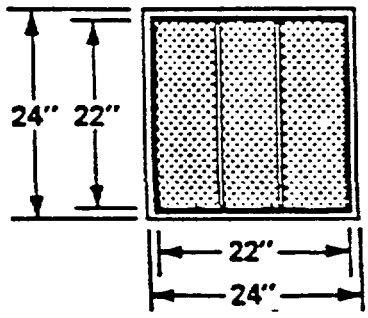
Metal Frame

Factory Testing Flanders Nuclear Grade Hepa Filters *(Per IES CS-1T, Type B)*

Each Flanders Nuclear Grade Hepa Filter having a face area of 24" x 24" is tested for both efficiency and resistance to airflow per Mil-Std-282 at the Nominal Rated Capacity (CFM) listed in Paragraph 1.2.1 of MIL-F-51068 (latest issue) and at 20% of the Nominal Rated Capacity. The filters are encapsulated during the test to insure that any leakage through the gasket or frame will contribute to the overall penetration. The test instrument, a Q 107 Penetrometer, generates a monodisperse challenge aerosol having a particle size of 0.3 μm. The test results are recorded upon both the filter label and the carton label as a penetration value (%); that is, the efficiency of the filter equals 100% minus the penetration. The maximum allowable penetration is .03%. The resistance to airflow in inches w.g. at the Nominal Rated Capacity is also recorded on the filter label. All filters are tested for efficiency and resistance.

The maximum allowable resistance at the Nominal Rated Capacity is 1.0" w.g. Of the five sizes appearing in the specification, the 24" x 24" x 11-1/2" and the 24" x 24" x 5-7/8" are the largest. Values for most of the other sizes are computed from one of these two depending upon the depth dimension of the unlisted filter and the effective face area of that filter relative to the listed size. The effective face area is obtained by subtracting one inch from the perimeter dimensions of the filter to allow for the thickness of the frame and the glue line. Thus, a 24" x 24" filter has an effective face area of 22" x 22".

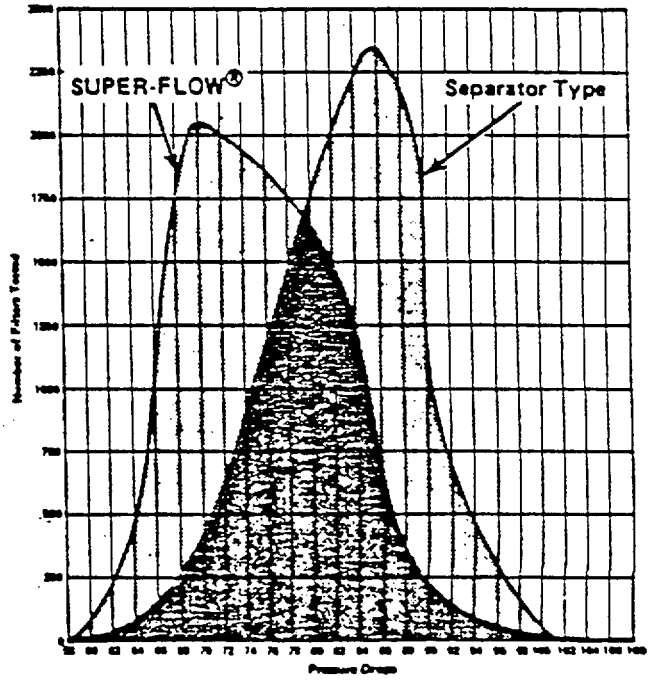
Example:



Filters having nominal depth dimensions of 12" and 6" have different operating characteristics. The pressure drop through a 6" deep filter at 500 CFM is lower than the pressure drop through a 12" deep filter at 1000 CFM, both sizes having a 24" x 24" outside dimension. Improvements in the media since the specification was first written have resulted in better performance of resistance to airflow than the 1.0" w.g. permitted by the specification would indicate.

But pressure drop itself is not a constant. As seen in the bell-shaped curves taken from a sample of 10,000 size 24" x 24" x 11-1/2" filters, the pressure drop for a filter will fall somewhere inside the bell-shaped curve when tested at the Nominal Rated Capacity (1000 CFM). Two curves are shown, one for SUPER-FLOW® filters and the other for separator type filters.

Comparison of Pressure Drops for SUPER-FLOW® and Separator Type Hepa Filters, Size GG-F



	Characteristics @ Flow = 1000 CFM					
	Resistance Inches w.g.		Variance	Standard Deviation	Reliability	Mode
	Average	Median				
SUPER-FLOW® Hepa Filters	.75	.76	.0047	.068	.75	.69
Separator Type Hepa Filters	.82	.82	.0046	.067	.76	.86

Several factors can affect the pressure drop. The boron silicate microfibers which are used to produce the filter media at Flanders are manufactured within a range of fiber dimensions according to the

manufactuer's own tolerances. The paper-maker must make frequent adjustments to compensate for differences in fiber sizes from one bale to the next or even within the same bale. The thickness of the medium is another factor affecting pressure drop. Flanders currently produces media for hepa filters averaging 17.5 mils in thickness for separator type filters and 21 mils thick in filters of the SUPER-FLOW® construction. The number of pleats of medium in a filter, the height of the glue line where the element is bonded to the frame and the kind of separator material can all influence performance. Physical constraints such as dividers and nipple connections are also factors.

In addition to the label recording, copies of filter test reports are furnished to the buyer. Nuclear Grade Hepa Filters meet the requirements of IES CS-1T for Type B Filters and are labelled accordingly.

Selecting a Hepa Filter for Size and Capacity

The filter sizes included in the original military standards reflect only the requirements of the military and government users at the time they were originally written and have not been expanded to include the many sizes offered by manufacturers today. A principal reason for this is the inherent physical weakness of the larger sizes; they should not be used where human health would be threatened, that is, in containment applications. Even in clean room applications experience has shown that the largest practical filter size is 24" x 48" x 5-7/8" since filters larger than that are difficult to ship and handle and are more prone to damage.

When sizing a filter for a particular application, the designer should keep in mind that although a velocity of 4-5 fpm through the medium was the basis for establishing the Nominal Rated Capacities in the military standard, hepa filters are frequently operated at capacities ranging from a third of that value to several times higher without a significant loss in efficiency. Indeed, the Nuclear Grade Hepa Filters must be tested at the Nominal Rated Capacity and again at 20% of that value. However, care should be taken when planning to operate a filter at higher capacities to determine if hostile environmental factors, if present, will cause filter failure. For example, water condensate upon the water resistant filter medium could plug the element and cause it to fail. Where space is critical, a designer is faced with sacrificing a lower pressure drop by using a smaller filter or, in a multiple bank, of using less filters. On the other hand, a filter bank can be oversized to decrease the pressure drop.

Most of the larger 5-7/8" deep filters offered by manufacturers were intended for laminar flow applications where the design criteria called for entire walls or ceilings of filters and velocities of 90 fpm ± 20 through the room from sidewall to sidewall (approximately 400 fpm through a 24" x 24" filter). The 11-1/2" deep filters are generally selected for service where a minimum amount of space relative to a maximum volume of airflow is required; most often in built-up banks, either in walk-in plenums or side-servicing housings. It is the 24" x 24" x 11-1/2" filter that is most frequently selected for these applications.

When selecting a hepa filter the following values can be used to obtain the initial pressure drop at a given volume. Although pressure drop vs. volume is not a straight line curve when plotted on a graph, it is close enough to a straight line that this data can be extrapolated on that basis.

Initial Pressure Drop Values, 11-1/2" Deep Filters

SUPER-FLOW®

Volume (CFM)	Filter Size Designators						Pressure Drop In Inches w.g.
	CC-F	GC-F	GE-F	YY-F	GG-F	GN-F	Avg.
	255	730	1160	1510	1600	2040	1.20
	225	635	1015	1325	1400	1785	1.05
	190	545	870	1135	1200	1530	0.90
	160	455	725	945	1000	1275	0.75
	130	365	580	755	800	1020	0.60
	95	275	435	565	600	765	0.45
	65	180	290	380	400	510	0.30
	30	90	145	190	200	255	0.15

Separator Type (Aluminum)

Volume (CFM)	Filter Size Designators						Pressure Drop In Inches w.g.
	CC-F	GC-F	GE-F	YY-F	GG-F	GN-F	Avg.
	255	730	1160	1510	1600	2040	1.30
	225	635	1015	1325	1400	1785	1.15
	190	545	870	1135	1200	1530	1.00
	160	455	725	945	1000	1275	0.82
	130	365	580	755	800	1020	0.66
	95	275	435	565	600	765	0.49
	65	180	290	380	400	510	0.33
	30	90	145	190	200	255	0.16

Nuclear Grade Hepa Filters; Suggested Specifications, Separator Type Construction

The filters shall be model (1)___ Nuclear Grade as manufactured by Flanders Filters, Inc., Washington, NC. The filter medium shall be all glass with a wet strength, water repellent binder in accordance with MIL-F-51079 (latest issue) and shall be produced by the filter manufacturer.

Each filter element shall be constructed by pleating a continuous flat sheet of medium back and forth over corrugated, .0015" thick aluminum spacers whose edges have been hemmed to resist tearing of the medium at the fold. The element shall be permanently bonded to a (2)___ integral frame with a fire retardant urethane sealant. The perimeter of the filter face shall have a (3)___to seal it to its mounting frame in service. Construction of the filter shall be in accordance with the essential construction requirements of MIL-F-51068 (latest issue).

Each filter shall be tested, while encapsulated, for resistance to airflow and penetration in accordance with Mil-Std-282 at the nominal rated capacity listed in Paragraph 1.2.1 of MIL-F-51068 (or, if not listed, as proportional to those listed values after factors for physical constraints are considered) and at 20% of that capacity for penetration only. The penetration at both flows shall not exceed 0.03%.

The hepa filters shall comply with the requirements for Type B Filters per IES CS-1T. Each filter and filter carton shall bear identical labels indicating the filter model number, compliance with IES CS-1T, the serial number and the resistance and penetration readings at both test flows taken for the filter on the manufacturer's Q 107 Penetrometer. In addition, the manufacturer shall provide a filter test and certification of compliance report for the buyer's record.

A label indicating compliance by the manufacturer with the requirements of UL 586 shall be attached to each filter. The manufacturer shall submit evidence that his filters have qualified in accordance with Paragraph 4.2 of MIL-F-51068 and that he is listed on the Qualified Products List (QPL).

Filters that are 24" x 12" x 6" and larger shall be packaged one filter per carton. Each filter shall be encased in a flanged, tight-fitting linerboard sleeve that fits within the carton, leaving a minimum 1-1/2" dead air space on the four sides of the filter. The top and the bottom of the filter shall be protected with a folded linerboard cushion. (OPTIONAL: Linerboard cartons shall be strapped to a Flanders Type II pallet with 3/8" plywood facing at both ends.

Fill in the numbered locations on the Suggested Specifications Text with a selection from the corresponding category below:

(1) Fluid Seal

a. 007 - C - 04 - 05 - NL
b. 007 - C - 02 - 05 - NL
c. 007 - C - 03 - 05 - NL

Gasket Seal

a. 007 - C - 04 - 00 - NL
b. 007 - C - 02 - 03 - NL
c. 007 - C - 03 - 03 - NL

(2) Frame Material

a. 3/4" Fire Retardant Plywood
b. 14 Gage Type 409 Stainless Steel
c. 14 Gage Type 304 Stainless Steel

(3) Frame Style

a. 1/4" x 3/4" Neoprene Gasket
b. 3/4" Deep Channel with Fluid Seal

The latest draft

September 9, 1987

Mr. Paul A. Giardina
Regional Radiation Representative
U. S. Environmental Protection Agency
26 Federal Plaza
Mail Stop 2AWM-RAD
New York, New York 10278

SUBJECT: Request for Determination of Construction or Modification
Dear Mr. Giardina:

As indicated in our July 7, 1987 letter to you, we have prepared the enclosed evaluation of the use of Portable Ventilation Units (PVUs) at the West Valley Demonstration Project (WVDP). We have also been in contact with individuals from the DOE Headquarters and DOE Idaho Operations Office. Based on the evaluation and discussions, we find that the PVUs constitute operational techniques for onsite contamination control and are not "new facilities" or "modified facilities" pursuant to the National Emission Standards for Hazardous Pollutants.

PVUs are used extensively within the nuclear industry as a means of controlling contamination spread within the workplace. In many instances, a temporary enclosure will be built to enclose an area where work with contaminated equipment or materials is to take place. The enclosure limits the area of potential contamination spread, and as an extra measure of protection, provides ventilation to the enclosure and filtration of the exhaust air. The routine use of temporary enclosures and PVUs is an element of good practice that has been fostered in an attempt to maintain exposures of workers and spread of contamination as low as reasonably achievable.As indicated in the enclosed evaluation, the releases of radioactivity from PVU's are extremely small and do not constitute a significant effluent stream at the WVDP.

The regulations in 40 CFR 61.15(d) (1) indicate that "maintenance, repair, and replacement which the administrator determines to be routine for a source category" is not considered a modification and therefore reporting and approval under 40 CFR 61.07 and 61.08 are not required. The uses of PVUs in support of routine maintenance, repair and replacement for existing facilities, should fall into this category.

We recognize that the EPA must be informed of major facility modifications such as those required at the West Valley Demonstration Project for the processing of high level liquid wastes. The applications for approval to modify sources at WVDP will include a discussion of emissions projected during the modification phase, including those from PVUs or other temporary emission

points. If the doses to the maximally exposed member of the public are projected to increase during the modification phase, then information concerning the design, installation and operation of the major emissions points will be provided. (Major emission points will be those responsible for greater than 10% of the projected dose to either the whole body or critical organ from the source).

In summary, the primary purpose for installing temporary enclosures with PVUs is for the protection of the worker and the prevention of contamination spread. It is our finding that PVUs used in support of routine maintenance, repair and replacement activities do not constitute new or modified sources. In cases where PVUs will be employed during the modification of a facility, this use will be adequately described in the application for approval to perform the modification (40 CFR 61.07).

We appreciate your timely review of this information. If you have any questions, please contact Ted Adams of my staff on (716) 942-4387.

Sincerely,

W. W. Bixby, Director
West Valley Project Office

cc: J. P. Hamric, DOE-ID, w/out enc.
S. Meyers, EPA, w/enc.
M. L. Walker, DOE-HQ, w/enc.

TGA:208:87 - 0155:87:09

TGA:LCW

ATTACHMENT III

GENERAL WVDP SPECIFICATIONS

FOR PORTABLE VENTILATION UNITS

CIN0243:SEA-72
07/23/87

Attachment to:
P.O. 1921177

1. The units shall have the following features:

   A) Blower (2 Hp min.) capable of providing a minimum of 4" water static pressure at 1000 cfm. Blower motor to be 440V, 3 phase.

   B) Spark arrestor and 24 x 24 x 5 7/8" prefilter (50-60% efficient).

   C) HEPA filter seal shall be knife type for use with neoprene gasketed filters. The unit shall be capable of housing a 24 x 24 x 11½" HEPA filter. The filter is not to be supplied with the unit.

   D) Inlet and outlet throttle/shutoff dampers compatible with 10" long ducting.

   E) Stainless steel two-door cabinet with "bag-out" capability.

   F) Cart mounted with overall dimensions less than 3 ft. wide x 4 ft high x 6 ft long. Shall be capable of vertical or horizontal operation and be equipped with a crane lifting ring.

   G) Magnihelic D/P gauge installed to monitor as a minimum: D/P across (1) all filters and (2) the HEPA filter only.

   H) Facilities measuring the efficiency (DOP) of the HEPA filter.

2. The vendor shall perform the following:

   A) Each unit shall be visually inspected IAW paragraph 5.0 of ANSI/ASME N510.

   B) The duct and housing of each unit shall be leak tested by the Pressure Decay Method IAW paragraph 6.0 of ANSI/ASME N510. Leakage shall be less than 0.1% of design capacity.

   C) The mounting frame of each unit shall be leak tested by the Pressure Decay Method IAW paragraph 7.0 of ANSI/ASME N510. Leakage shall be less than 0.1% of design capacity.

   D) Reports for each inspection/test shall be generated as per the requirements of ANSI/ASME N510 and shall be supplied to WVNS for approval upon delivery of the units. Any deficiencies found and repaired during performance of any inspection/test shall be recorded, and reported to WVNS.

3. Final acceptance of the units shall be based on successful completion of a satisfactory DOP test performed by WVNS personnel at WVNS. (Satisfactory test based on retention of 99.97% of 0.3 micron particles at 1000 cfm).

REQUIREMENTS FOR PVU

1. General Description

A. PVU shall be manufactured and tested in accordance with ANSI N-509 and N-510 using a dummy filter.

B. PVU shall be compatible with WVNS stock HEPA filters which employ Flanders Fluid Seals. HEPA size 24" x 24" x 11 1/2".

C. PVU shall be operable in either horizontal or vertical position.

D. PVU filter housing shall be stainless steel with full "bag-out" capability and shall have separate doors for filter removal such that the pre-filter and/or roughing filter may be changed without violating the HEPA filter DOP test validity.

E. Ruffing filter size 23 7/8" x 23 7/8" x 4". 2 each required efficiency 45 to 50%.

F. Pre-filter is in addition to the 2 ruffing filters. 23 7/8" x 23 7/8" x 1 7/8", efficiency 30%, placed in the same compartment as the 2 roughing filters.

G. PVU shall include a spark arrestor or washable filter to trap welding sparks and/or airborne oil or grease.

H. PVU shall include a Magnihelic D/P gauge and valve system to allow the monitoring of:

- o Pressure drop across the roughing/pre-filter section
- o Pressure drop across the HEPA only
- o Pressure drop across all filters
- o Just the system inlet pressure

I. PVU shall have an air flow throttle adjustment to allow controlling air flow rate and/or static pressure.

J. PVU shall have facilities for performing HEPA filter DOP efficiency testing.

K. PVU shall have a crane lifting ring over the unit center of gravity.

II. Technical Description

A. Nominal system flow rate 2000 cfm.

B. Blower capacity shall be 2450 cfm or better when driven by a 10 Hp motor.

C. Motor rated capacity shall be 10 Hp, to run on 440 volts 3 phase electrical power.

D. Portable VV overall dimensions shall not exceed:
- o Weight 600 lb
- o Length 72 inches
- o Width 28 inches
- o Height 45 inches

III. Documentation Required

A. PVU leak test (ANSI N-510) data sheet(s) shall be enclosed with the packing slip and shipping papers and shall include:

1. Company name
2. Date test performed
3. Test equipment identification
4. Date of test equipment calibration
5. Actual test data
6. WVNS PO No.
7. Signature of person performing the test
8. Signature of vendor's QA representative, and date, signifying approval of the test performance of data recorded.

B. Certificate of Compliance with the requirements of the Purchase Order.

Rdg.

West Valley Project Office
Idaho Operations Office
P.O. Box 191
West Valley, NY 14171

July 9, 1987

Mr. J. E. Krauss, President
West Valley Nuclear Services Co., Inc.
P. O. Box 191
West Valley, New York 14171

SUBJECT: Operation of Temporary Ventilation Units for the M-8 Riser

Dear Sir:

Based on discussions with EPA Region II, you are hereby authorized to proceed with the utilization of a temporary ventilation unit for the M-8 riser in an effort to obtain information associated with the contamination incident on June 19, 1987. You should, in parallel, proceed with preparing a generic permit application for utilization of such systems in general at the site.

Sincerely,

W. W. Bixby, Director
West Valley Project Office

cc: J. P. Hamric, DOE-ID
J. H. Barry, DOE-ID

WWB:033:87 - 0025:87:01

WWB:tl

Request For Approval To Construct Of Modify

New Sources of Radionuclide Emissions (40 CFR 61, Subpart H)

I. NAME AND ADDRESS OF APPLICANT

US Department of Energy
West Valley Demonstration Project Office
P.O. Box 191
West Valley, New York 14171-0191

OPERATING CONTRACTOR

West Valley Nuclear Services Co., Inc.
P.O. Box 191
West Valley, New York 14171-0191

II. NAME AND LOCATION OR PROPOSED LOCATION OF THE SOURCE

Portable Ventilation Unit 1
West Valley Demonstration Project
Rock Springs Road
West Valley, New York 14171
Date of Construction/Modification: September 1986
Date of Startup: September 1986

III. RELEASE POINT INFORMATION

Emission Point ID	PV01	Inside Dimensions (inches)	10 dia.
Ground Elevation (Ft. MSL)	Variable	Exit Temperature (°F)	70°
Height Above Structures (ft)	Variable	Exit Velocity (ft/sec)	30
Stack Height (ft)	Variable	Exit Flow Rate (ACFM)	1000

IV. TECHNICAL INFORMATION ABOUT SOURCE

A. Nature, Size and Design Capacity

The portable ventilation unit is a small (1000 cfm) stand alone unit used to supplement existing ventilation systems for operations requiring additional control of airborne radioactivity. An example of such an operation is ventilation of a temporary containment tent or temporary airlock.

B. Method of Source Operation and Description of Emission Controls

The portable vent system will be used on an "as needed" basis to support various project maintenance and decontamination activities. The system is equipped with a spark arrestor, prefilter and HEPA filter. Monitoring for radioactivity will be done by an alpha/beta continuous air monitor either in the area being ventilated or at the point of discharge.

C. Emission Estimates

Emission estimates are based on a ground level release of air at 75% of the WVDP concentration guide limits for airborne contamination (i.e., 75% of 2×10^{-12} uCi/ml gross alpha, 1×10^{-9} uCi/ml gross beta). Alpha activity is assumed to be Am-241 and beta activity is assumed to be Sr-90. Annual doses are based on operation for eight hours per day and 120 days per year. The dose to the maximally exposed off-site individual from such a source is estimated to be 2.6×10^{-7} mrem/year.

Doses are calculated using site specific meteorological data combination with AIRDOS-EPA. EPM-3, a variable-trajectory gaussian puff dispersion model, was used to calculate relative concentrations of radioactivity from routine operational releases. The maximum mean annual relative concentration (X/Q) values at actual residences in the vicinity of the site are 1.5 E-7 sec/m^3 (at 2.1 km WSW) and 9.5 E-7 sec/m^3 (at 1.4 km NW) for stack and ground level release, respectively.

The data tabulated X/Q values are used as input to AIRDOS-EPA to calculate the radiation dose to the maximally exposed individual (at the closest residence). The dose thus reported is the 50-year committed effective dose equivalent as calculated by the ICRP 26 formula.

Request For Approval To Construct Of Modify

New Sources of Radionuclide Emissions (40 CFR 61, Subpart H)

I. NAME AND ADDRESS OF APPLICANT

US Department of Energy
West Valley Demonstration Project Office
P.O. Box 191
West Valley, New York 14171-0191

OPERATING CONTRACTOR

West Valley Nuclear Services Co., Inc.
P.O. Box 191
West Valley, New York 14171-0191

II. NAME AND LOCATION OR PROPOSED LOCATION OF THE SOURCE

Portable Ventilation Unit 2
West Valley Demonstration Project
Rock Springs Road
West Valley, New York 14171
Date of Construction/Modification: September 1986
Date of Startup: September 1986

III. RELEASE POINT INFORMATION

Emission Point ID	PV02	Inside Dimensions (inches)	10 dia.
Ground Elevation (Ft. MSL)	Variable	Exit Temperature (°F)	70°
Height Above Structures (ft)	Variable	Exit Velocity (ft/sec)	30
Stack Height (ft)	Variable	Exit Flow Rate (ACFM)	1000

IV. TECHNICAL INFORMATION ABOUT SOURCE

A. Nature, Size and Design Capacity

The portable ventilation unit is a small (1000 cfm) stand alone unit used to supplement existing ventilation systems for operations requiring additional control of airborne radioactivity. An example of such an operation is ventilation of a temporary containment tent or temporary airlock.

B. Method of Source Operation and Description of Emission Controls

The portable vent system will be used on an "as needed" basis to support various project maintenance and decontamination activities. The system is equipped with a spark arrestor, prefilter and HEPA filter. Monitoring for radioactivity will be done by an alpha/beta continuous air monitor either in the area being ventilated or at the point of discharge.

C. Emission Estimates

Emission estimates are based on a ground level release of air at 75% of the WVDP concentration guide limits for airborne contamination (i.e., 75% of 2×10^{-12} uCi/ml gross alpha, 1×10^{-9} uCi/ml gross beta). Alpha activity is assumed to be Am-241 and beta activity is assumed to be Sr-90. Annual doses are based on operation for eight hours per day and 120 days per year. The dose to the maximally exposed off-site individual from such a source is estimated to be 2.6×10^{-7} mrem/year.

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Request For Approval To Construct Of Modify

New Sources of Radionuclide Emissions (40 CFR 61, Subpart H)

I. NAME AND ADDRESS OF APPLICANT

US Department of Energy
West Valley Demonstration Project Office
P.O. Box 191
West Valley, New York 14171-0191

OPERATING CONTRACTOR

West Valley Nuclear Services Co., Inc.
P.O. Box 191
West Valley, New York 14171-0191

II. NAME AND LOCATION OR PROPOSED LOCATION OF THE SOURCE

Portable Ventilation Unit 3
West Valley Demonstration Project
Rock Springs Road
West Valley, New York 14171
Date of Construction/Modification: September 1986
Date of Startup: September 1986

III. RELEASE POINT INFORMATION

Emission Point ID	PV03	Inside Dimensions (inches)	10 dia.
Ground Elevation (Ft. MSL)	Variable	Exit Temperature (°F)	70°
Height Above Structures (ft)	Variable	Exit Velocity (ft/sec)	30
Stack Height (ft)	Variable	Exit Flow Rate (ACFM)	1000

IV. TECHNICAL INFORMATION ABOUT SOURCE

A. Nature, Size and Design Capacity

The portable ventilation unit is a small (1000 cfm) stand alone unit used to supplement existing ventilation systems for operations requiring additional control of airborne radioactivity. An example of such an operation is ventilation of a temporary containment tent or temporary airlock.

B. Method of Source Operation and Description of Emission Controls

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C. Emission Estimates

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The data tabulated X/Q values are used as input to AIRDOS-EPA to calculate the radiation dose to the maximally exposed individual (at the closest residence). The dose thus reported is the 50-year committed effective dose equivalent as calculated by the ICRP 26 formula.

MAKE SURE! WRITE IT!

TO: RELawrence / SMarchette / DPloetz / PKlanian / Harmon

DATE: 6/26/87

FROM: RFGessner

SYS. #:

SUBJECT: Portable Ventilation Units (PVU)

I discussed use of Portable Ventilation Units with Ken Krabenschuh with regard to recent EPA questions on temporary stacks. Result — No PVU should be used for radioactive work outside or in any un-ventilated area without reviewing the situation with Lyle Roberts.

There is no exemption for PVU release points from EPA requirements.

COPY TO:

P. S. CHURCH	____	B. F. LEWIS	____	H. J. SHAFFNER	____
J. L. CODD	____	T. F. MURAWSKI	____	G. G. TROWBRIDGE	____
J. C. CWYNAR	____	F. D. NELSON	____	L. J. WIEDEMANN	____
H. J. FARNER	____	J. PAUL	____	OTHERS	____
B. C. GAY	____	D. F. PEZZIMENTI	____		____
R. F. GESSNER	____	D. J. PLOETZ	____		____
R. G. GREENWALD	____	W. J. POTTS	____		____
T. HUGHES	____	R. F. RETTBERG	____	Krabenschuh	
P. S. KLANIAN	____	R. L. SCHARF	____	Roberts	

BMS0003
3/3/87